

**COASTAL COMMUNITY RESILIENCE GRANT PROGRAM FY14  
RFR ENV 14 CZM 06**

**Applicant:** Brewster, Massachusetts (Cape Cod & the Islands)  
**Address:** Brewster Town Offices  
2198 Main Street  
Brewster, MA 02631

**Local Project Manager:**

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**Department:** Natural Resources  
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**Type of Adaptation Project** (StormSmart climate adaptation action):

1. Conducting public education and awareness or other communication initiatives;
2. Assessing vulnerability and risk;
3. Identifying and implementing management measures, standards, or policies;
4. Redesigning to accommodate changing conditions; and
5. Enhancing natural storm-damage protection.

**Project Title:** **BUILDING COASTAL RESILIENCE IN BREWSTER**

**Total Project Cost:** \$298,925

**Match Amount** (at least 25% of TOTAL project cost): **\$98,925 (33%) Town & Partner Match**  
(\$50,000 cash, \$18,000 in-kind by Town, \$10,000 match in other work by Town, \$10,925 In-Kind match by APCC, \$10,000 match in grant funds by APCC)

**Grant Amount Requested** (maximum of \$200,000): **\$200,000**

**Project Summary** (brief description of the proposed project in one or two short paragraphs)

Brewster owns and maintains 10 coastal Landings, which are used heavily by residents and the substantial tourist population. These points are also key access points for emergency response, access to shellfish grants, and access for coastal nourishment projects. In recent years, storm damage and annual erosion rates of over 1 foot have significantly impacted Town parking areas, beaches, roads and access points. The Town has invested large sums in recent years to repair these landings and the natural systems surrounding them, including over \$2,000,000 in salt marsh restoration and coastal retreat projects. This proposal will identify the natural systems at risk, the forces shaping coastal change, including sediment fate and transport, and projected sea level rise, and allow the Town to conduct long term planning to relocate or adapt our most at-risk infrastructure.

Our proposal includes a major coastal retreat design for one of the largest beach parking lots, including restoring former parking areas to coastal dune and green stormwater control; a measured retreat at two landings that have suffered significant repetitive losses; a sediment study including Brewster's entire coastline (and extending partially into each neighboring town); photo-documentation and habitat monitoring at each coastal Landing; and engineering evaluation of each Landing and beach with short and longer term recommendations for nourishment or alterations and the effect on the natural systems surrounding each location.

# **BUILDING COASTAL RESILIENCE IN BREWSTER**

## **SECTION 1. COMMUNITY'S APPROACH TO MANAGEMENT OF EROSION AND FLOODING HAZARDS**

Brewster's actions in coastal retreat at Paines Creek Landing have been described as a model example. In this location, we removed a large paved parking lot suffering from repetitive storm damage, restored the area to dune and beach, and established a new, small parking area further landward outside of the dune. The new parking area is much more resilient in design, and has suffered minimal damage even with severe storms. A portion of the design was to capture and treat all stormwater from the roadway and parking lot. Town meeting supported this retreat project as do neighbors and visitors to the site.

At other landings Brewster has developed sacrificial vegetated dunes and sturdy sand drift fence to lessen the impacts of coastal storm events. We have a regular program of beach nourishment at several beaches suffering annual erosion. We have also focused on capturing and treating stormwater, using a watershed based approach. Each of these projects has had strong support at Town meeting and through state and federal funding partners.

## **SECTION 2. DESCRIPTION OF ISSUES/PROBLEMS**

The Town of Brewster is a rural coastal town on Cape Cod, located on Cape Cod Bay. Brewster is approximately 25 square miles in area, with a shoreline of over 6 miles. At low tide, the sea recedes up to two miles offshore, exposing approximately 12,000 acres of tidal flats in Brewster alone. Our year round population is approximately 9,820, plus a 25,000 person seasonal population. Our local economy is largely tourism based, and "the beach" is the number one reason tourists visit, as reported by the Brewster Chamber of Commerce. Brewster is very rural, with nearly one-third of its land area as protected open space.

Brewster's 10 Landings provide access to public beach and the extensive tidal flats. Many of these Landings do not have large parking areas and are mostly just the road layout where it reaches the beach. Brewster is facing many management decisions for its landings and beaches as most are located between a beach/dune area and wetlands. The coastal area is critically important to Brewster's coastal character and economy. In past years the Town has lost available parking spaces at four of its larger parking areas; we have addressed one through coastal retreat/habitat restoration and rebuilding of the parking area at Paines Creek Landing, and propose to correct the three most at-risk landings through this proposal. (Att. 1.)

The impact of stormwater on our landings has also been severe. These coastal landings are typically at the north end of a roadway that drops in elevation as it approaches the coast. These historic landings were not designed with stormwater collection and treatment, and the sudden and greater volume rainfall events we have been experiencing with climate change are causing erosion and pollution of our coastline. The proposal addresses stormwater control at three of our most at risk landings, through permeable surfaces and natural swales or bioretention basins.

The Town's entire coastline is currently in the FEMA VE flood zone and most or all of its tidal marsh and creek system are mapped as AE. In the past five years, extensive parts of coastal Brewster have been exposed to storm surge impacts, including dune washover, flooding and significant erosion. In some areas, up to 20 feet of dune/coastal bank have been lost in a single storm event. We have a number of limited scientific studies that have informed the project concepts and designs presented in this proposal. The Town is proposing to contract for three critical scientific and engineering studies (1) development of a sediment budget to identify resilient and vulnerable coastal landforms, using the Provincetown Center for Coastal Studies methodology and (2) assessing existing conditions, habitats, vulnerable infrastructure, and likely future effects of erosion and sea level rise; and (3) developing plans for coastal retreat and habitat restoration at three of our most vulnerable coastal landings. All three of these will be incorporated into the town-wide Coastal Resiliency Plan and Hazard Mitigation Plan and inform future coastal adaptation, resiliency and restoration priorities and actions.

In 1985, the Commonwealth of Massachusetts designated the 2,600-acre Inner Cape Cod Bay Area of Critical Environmental Concern (ACEC) after its nomination by the Towns of Brewster, Eastham, and Orleans. The ACEC includes hundreds of acres of salt marsh, highly productive shellfish beds, undisturbed wildlife habitat, rare species habitat, barrier beaches, salt ponds, and tidal creeks. The Town has approximately 450 acres of tidal creeks and marshes with three principal tidal creeks- Quivett and Paines at the west end of Town and Namskaket at the east end. The Town and its partners have purchased and protected most of these estuaries.

Designation of the Inner Cape Cod Bay Area of Critical Environmental Concern is the highest level State designation for coastal resources and is intended to foster appreciation and stewardship of the unique natural and cultural resources in an area. The designation includes a voluntary limitation of activities that can be conducted in the area.

The proposed project complements numerous previous Town restoration initiatives, including:

- Restoration of Stony Brook/Paines Creek watershed to restore 41 acres of tidally-restricted salt marsh, improve habitat for rare salt marsh species (*Spartina cynosuroides*, *Lilaeopsis chinensis*), improve stream flow and fish passage to 386 acres of spawning and nursery habitat for river herring and American eels;
- Restoration of a coastal beach and dune at Paines Creek Beach following removal of a parking area from coastal dune and relocation of the parking area landward;
- Remediation of stormwater runoff into Stony Brook watershed at Stony Brook Mill, Paines Creek Road, and Paines Creek Beach and development of plans for other sections including the proposed Betty's Curve bioretention project;
- Restoration of 10 acres of tidally-restricted salt marsh at Namskaket Salt Marsh and 10 acres at Quivett Creek Salt Marsh on the eastern and western boundaries of Brewster, respectively;
- Town meeting approval of a zoning bylaw designating a Natural Resources Protection District, one of two such zoning bylaws passed on Cape Cod;
- Brewster's Integrated Water Resource Management Planning program, which incorporates the impacts of sea level rise and stormwater remediation projects
- Planning Board through Town Meeting adopted a new stormwater control bylaw;
- Open Space Committee has been incredibly successful, collaborating with the Brewster Conservation Trust in protecting/acquiring areas important for conservation, including vulnerable coastal areas and parcels in sensitive environments. The Committee also works closely with the Recreation Department relative to acquiring lands which can be used for conservation and recreation.

Many agencies and organizations have invested heavily in these projects to protect and restore Brewster's coastal resources. In the last eight years alone, over \$3 million in technical assistance and/or funding has been provided by: Gulf of Maine Council/NOAA Habitat Restoration Grant, NOAA-ARRA Coastal Restoration grant for \$1.6 million, MA Division of Ecological Restoration, MA DEP 319 and MA DEP 604B grants for stormwater, USDA Natural Resources Conservation Service, Cape Cod Conservation District, Mass Bays Program, Association to Preserve Cape Cod, Corporate Wetlands Restoration Program, MA Department of Conservation and Recreation, MA Coastal Zone Management, MA Division of Marine Fisheries, and private foundations.

### **SECTION 3. PROJECT DESCRIPTION:**

The project is broken into several phases that will occur simultaneously, using multiple engineers and partners.

#### **Proposed Tasks and their objectives:**

The *Massachusetts Climate Change Adaptation Report* (MCCAR) identifies 12 strategies. Brewster's proposal specifically addresses each of these strategies in its approach.

**Task 1. Assessment, Planning and Design for Coastal Resiliency:** The overall objectives of this task and subtasks are to increase the resiliency of the Town's natural coastal systems and community to sea level rise, coastal erosion, storm damage and flooding by developing specific data and recommendation that can be incorporated into a comprehensive Town-wide Coastal Resiliency Plan. These tasks were designed to fulfill the StormSmart Coast Climate Adaptation: Strategy 2. Assess Vulnerability and Risk. Specific activities include:

**Subtask 1.1. Assessment of Coastal Sediment Budget to Identify Resilient Coastal Habitat:** The objective is to determine the resiliency and vulnerability of Brewster's shore and coastal landforms to coastal erosion, sea level rise and flooding. This assessment is a critical building block for the development of adaptation strategies in response to climate change, as sediment is vital to sustaining and preserving the resiliency of coastal landforms, habitat, and ecosystems. Similar scientific surveys have been completed for the Outer Cape and the Cape Cod Bay shore of Provincetown and Truro (Giese et.al, 2011 and Giese,et.al, 2012). This study will include the sub-regional littoral cell of the Cape Cod Bay coastline from the west end of Dennis, along the Brewster shore, to a small section of Orleans to the east. See the attached proposal from the Provincetown Center for Coastal Studies

**Outputs:** A sediment budget that characterizes and quantifies, at a century scale, the sources and sinks of sediment and the volume, rate and direction of sediment movement along the coast. Specific areas of erosion and accretion will be identified. The project includes review of historic geospatial data; developing a historic surface model; developing a contemporary surface model; constructing transects along the 11.3 km shoreline; volumetric analysis, and preparation of a comprehensive report and recommendations. The report will include a discussion of shoreline change over the last 80 years, will identify high erosion areas and sources and sinks of sediment, and provide recommendations for the Town's Coastal Committee and Town staff to guide responses to climate change and sea level rise and their effect on Brewster's coastline. **Deliverables:** field data, final modeling results, draft and final reports, two presentations to the Town of Brewster Coastal Committee, Town officials and engineer. **Responsible Party:** Provincetown Center for Coastal Studies. **Schedule:** Begins within one month of contract. **MCCAR Strategies addressed:** 2. Identify and fill critical information gaps; 3. Advance risk and vulnerability assessments; 9. Continue to seek expert advice and stakeholder input.

**Subtask 1.2. Engineering Analysis of 10 Public Landings:** The objective is to identify and monitor existing conditions at each of the Town's 10 public landings; integrate information on coastal erosion and sediment movement, and provide short and long term recommendations for maintenance and sustainability for each location. This includes topographic survey and developing existing condition plans; delineating wetland resources; developing beach profiles/transects and monitoring protocols; and conducting grain size analysis at each beach. The engineer will also work with the Provincetown Center for Coastal Studies to incorporate the results of the sediment study. We have attached a proposal for this scope of work from CLE Engineering, Inc. (Att. 3)

**Outputs:** A Monitoring scope of work describing features to measure, methodology, and recommended frequency; recommended actions for 5, 10 and 30 year time frames for each landing; a Notice of Intent filing for each site, including maintenance and nourishment protocols; three public meetings to discuss the findings and recommendations (in addition to permitting meetings); and preparation of a Coastal Landing Atlas documenting the study. **MCCAR Strategies addressed:** 1. Combine mitigation and adaptation strategies; 2. Identify and fill critical information gaps; 3. Advance risk and vulnerability assessments; 4. Evaluate and prioritize adaptation strategies for implementation; 6. Improve planning and land use practices; 7. Enhance emergency preparedness; 8. Encourage ecosystem based adaptation; 9. Continue to seek expert advice and stakeholder input; 10. Ensure agency and regional coordination.

**Subtask 1.3. Assessment and Monitoring of Natural Systems:** The objective is to identify and monitor natural systems (e.g., coastal dunes, beaches, coastal banks, salt marshes, tidal estuaries, coastal wetlands, undeveloped coastal floodplain, rare species habitat, open space, water and wetlands) at each coastal Landing. (Att. 4)

This will also include seasonal monitoring of sediment movement on beaches, guided by the monitoring protocol developed in Subtask 1.2 above. The Association to Preserve Cape Cod (APCC) will provide photo-documentation at each of the 10 Town landings. Town staff will assist with interim monitoring after storm events. APCC will also monitor habitat utilizing the Natural Communities system using the Massachusetts Natural Heritage and Endangered Species Program (NHESP) field forms.

**Outputs:** The identification of the natural systems and habitat at each location, as well as seasonal and storm-related sediment movements are an essential part of building in resiliency to our coastal infrastructure. This will be utilized to evaluate possible effects of nourishment and infrastructure changes, and identify at-risk natural systems to monitor and protect. **Deliverables:** Monitoring data and reports. **Responsible parties:** APCC and Town. **Schedule:** 1 year of monitoring. **Milestones:** Three photo-documentation reports, data sheets, presentation to Brewster Coastal Committee. **MCCAR Strategies addressed:** 2. Identify and fill critical information gaps; 3. Advance risk and vulnerability assessments; 8. Encourage ecosystem based adaptation; 9. Continue to seek expert advice and stakeholder input.

**Subtask 1.4. Planning for the Effects of Rising Sea Level:** This task will evaluate the effects of sea level rise on Brewster's coastal habitat. The Brewster Coastal Committee will also develop brochures and interpretive materials that will assist with public outreach (see also outreach activities in Task 4).



Sea Level Rise scenario: The development of the sediment budget proposed in this project will provide Brewster with local, site-specific data on current and historic coastal elevation and long-term rates of change. These data are necessary to developing a local resiliency plan that incorporates recent sea level rise predictions (Sallenger, et.al. 2012; corrected in 2013). CLE Engineering will be developing a monitoring scope of work for the Town's 10 coastal landings that will include recommended actions for 5, 10 and 30 year time frames for each landing. CLE Engineering will work in collaboration with PCCS to determine the appropriate relative rate of sea-level rise for these planning horizons that incorporates the site-specific long term rates of coastal change.

**Outputs:** Deliverables: Draft and final plan that inventories habitats at risk from rising sea level and recommendations for measures to improve habitat resiliency. Responsible parties: The Town. Schedule: To be initiated upon review of data from other Task 1 assessments. Milestones: The Brewster Coastal Committee will utilize the data and recommendations from the engineers and APCC to develop an inventory of at-risk habitats based on sediment movement, erosion, sea level rise, and other key factors.

**MCCAR Strategies addressed:** 1. Combine mitigation and adaptation strategies; 2. Identify and fill critical information gaps; 3. Advance risk and vulnerability assessments; 4. Evaluate and prioritize adaptation strategies for implementation; 5. Support local communities; 6. Improve planning and land use practices; 7. Enhance emergency preparedness; 8. Encourage ecosystem based adaptation; 9. Continue to seek expert advice and stakeholder input; 11. Promote communication and outreach.

**Task 2. Restoration and Resiliency Projects:** The objectives of these on-the-ground restoration projects are to increase coastal resilience and restore fish and wildlife habitat. Subtasks include the following:

**Subtask 2.1. Adaptive Management of Mant's Landing:** The paved parking area at Mant's Landing Beach is located in a dune at a very low elevation, and suffers from repetitive storm damage. The objective is to test the use of a removable flexible articulating concrete mat, successfully used elsewhere on Cape Cod, as an interim replacement for a paved parking area on a beach until a permanent solution can be found [See Mant's Conceptual Plan & Proposal]. (Att.5)

**Outputs:** 100% design plans and bidding documents. **Deliverables:** Public stakeholder meetings, survey, draft and final engineering plans and permitting. **Responsible parties:** The Town and its contractor. **Schedule:** This subtask will be initiated immediately upon selection of a contractor. **Milestones:** Public meetings, public support for proposed plans is expressed, survey, draft and final plans are prepared, permit applications prepared and submitted, permits obtained.

**MCCAR Strategies addressed:** 1. Combine mitigation and adaptation strategies; 3. Advance risk and vulnerability assessments; 4. Evaluate and prioritize adaptation strategies for implementation; 7. Enhance emergency preparedness; 8. Encourage ecosystem based adaptation; 9. Continue to seek expert advice and stakeholder input; 10. Ensure agency and regional coordination; 12. Start now, be bold.

**Subtask 2.2. Planning and Design for Managed Retreat at Ellis Landing:** This task involves planning and design for resilient infrastructure at Ellis Landing. The objective is to plan for managed retreat, provide sustainable public access that minimizes or avoids impacts on habitat, and reduce the risk of damage and need for continued public investment. (Att. 6)

Ellis Landing is a key access point for the Town's shellfish programs, as well as for private aquaculture grants located directly north and west from the landing. It also provides essential beach access, including access for beach nourishment projects, and serves as one of Brewster's emergency beach access points. The parking lot has suffered severe repetitive damage from coastal storms and erosion. A stormwater catch basin formerly servicing the parking area now sits on the open beach and the partial revetment for the parking area is in disrepair and does not function.

The conceptual design incorporates a return for the neighboring revetment where it meets the coastal dune located to the east of the site. That aspect of the work is located partially on private property and its construction is not being undertaken nor financed by the Town. However, the engineer for the Town has been involved in the design of that portion of the work, which includes a measured retreat and a combined stone and coir protective return from the adjacent revetment, because it is partially located on Town property. The remaining work located entirely on Town property includes a resilient articulating concrete mat (ACM) ramp leading down to the beach. The ACM would be buried beneath screened sand compatible with the beach sediments, and a schedule for nourishment would be included in the permit.

The Town is also completing stormwater work within the landing and the roadway to the south. This is anticipated to be constructed in the fall of 2014 and is presented as another local match to this project (no funds for design, permitting or construction of the stormwater work is included in this grant application, but will instead be from Town funds).

**Output:** 100% design plans and bidding documents. **Deliverables:** Public stakeholder meetings, survey, draft and final engineering plans and permitting. **Responsible parties:** The Town and East Cape Engineering. **Schedule:** This subtask will be initiated immediately. **Milestones:** Public meetings, public support for proposed plans is expressed, survey, draft and final plans are prepared, permit applications prepared and submitted, permits obtained.

**MCCAR Strategies addressed:** 1. Combine mitigation and adaptation strategies; 3. Advance risk and vulnerability assessments; 4. Evaluate and prioritize adaptation strategies for implementation; 7. Enhance emergency preparedness; 9. Continue to seek expert advice and stakeholder input; 10. Ensure agency and regional coordination; 12. Start now, be bold.

**Task 3. Restoration and Resiliency Project:** The objectives of this on-the-ground restoration projects are to increase coastal resilience and restore habitat. These tasks were designed to fulfill the StormSmart Coast Climate Adaptation: Strategy 4. Redesigning to Accommodate Changing Conditions and Strategy 5. Enhancing Natural Storm-damage Protection. Subtasks include the following:

**Subtask 3.1. Relocation of Breakwater Landing Beach Parking Area, Restoration of Beach and Dune Habitat, Green Stormwater Infrastructure:** The objective is to remove the vulnerable portion of the paved Town parking lot at Breakwater Landing Beach, restore the coastal beach and dune habitat, build a replacement parking lot using porous pavement at a more inland and elevated area, and install green stormwater infrastructure (e.g., vegetated bioretention or vegetated swale) to improve water quality for swimming, shellfishing and habitat. [See Engineered Plans and proposal from Horsley Witten Group] (Att.7)

**Outputs:** 100% design plans and bidding documents for removal and relocation of the parking lot, restoration of habitat, and improved access paths. **Deliverables:** Stakeholder meetings, draft and final plans, cost estimates, permitting, bid documents. **Responsible parties:** The Town and Horsley Witten Group. **Schedule:** To be completed by fall 2014. **Milestones:** Draft and final plans, permit applications and received permits, bid specs.

**MCCAR Strategies addressed:** 1. Combine mitigation and adaptation strategies; 3. Advance risk and vulnerability assessments; 4. Evaluate and prioritize adaptation strategies for implementation; 6. Improve planning and land use practices; 7. Enhance emergency preparedness; 8. Encourage ecosystem based adaptation; 9. Continue to seek expert advice and stakeholder input; 10. Ensure agency and regional coordination; 12. Start now, be bold.

**Task 4. Provide Public Outreach to Build Support for Proposed and Future Resiliency Measures.** The objective is to build citizen support for proposed resiliency measures and for future measures by providing public outreach on the benefits of protecting and restoring natural coastal systems. These tasks were designed to fulfill the StormSmart Coast Climate Adaptation: Strategy 1. Conducting Public Education and Awareness or Other Communication Initiatives and Strategy 3. Identifying and Implementing Management Measures, Standards or Policies.

The Brewster Coastal Committee, comprised of seven citizens appointed by the Board of Selectmen, will work with the Project Manager and Project Team, reviewing materials and advising on final recommendations of the Coastal Resiliency Plan. Outreach and public information activities will include at least two public informational meetings, press releases, a Town web-page describing the project and progress on specific tasks, public service announcements, and outreach to specific landowner and community groups. Special interpretive signs will be designed for each of the restoration sites to build public understanding about the nature and value of the projects. Funds will be used for GIS and professional services and printing.

**Outputs:** Development of a Coastal Resilience Plan, public stakeholder meetings, webpage, press releases, a Town webpage describing projects and progress, draft interpretive signs for each implementation project, outreach to specific landowners or community sectors, PSAs via radio, posters and fact sheets. Throughout the entire project, the Town will exercise opportunities to provide outreach and provide user-friendly materials. **Responsible parties:** The Town. **Schedule:** Outreach will begin as soon as grant contract is approved. **Milestones:** Initial press release announcing grant, meetings, and development of deliverables.

**MCCAR Strategies addressed:** 5. Support local communities; 6. Improve planning and land use practices. 9. Continue to seek expert advice and stakeholder input; 10. Ensure agency and regional coordination; 11. Promote communication and outreach; 12. Start now, be bold.

**Sustained Benefits:** The extensive public outreach activities detailed herein will provide Brewster citizens with a better understanding of how the Town's coastal resources have evolved and their current and future vulnerabilities to erosion, sea level rise, storms and coastal change.

Other sustained benefits include:

- Less public infrastructure at risk (redesign of three coastal landings)
- Reduced need for continued public investment in hard infrastructure (retreat and resilience designs)
- Enhanced value of ecosystem services provided by coastal resources (dune restoration)
- Guide for public for management of privately owned coastal properties (example projects to emulate)
- Improved water quality and reduction in maintenance costs through implementation of green stormwater infrastructure (improved stormwater control at three landings)

**The success of Brewster's Coastal Resiliency Program will be measured by a number of indicators including the following:**

1. Integration of the Coastal Adaptation Plan into the Town's Local Comprehensive Plan and its Long Range Capital Plan, establishing Town policies and departments' priorities for projects and activities in Brewster's coastal zone;
2. Permitting for restoration of 325 linear feet of beach and dune area at three sites through managed retreat and relocation of susceptible infrastructure;
3. Once the plans are implemented at the three landings, improvement in water quality in receiving bodies and trapping of pollutants in stormwater treatment systems as measured by monitoring;
4. Public support for future coastal resiliency and restoration projects, as demonstrated by voter approval of budget requests at Town Meeting.

**Volunteer Engagement:** Brewster has an active volunteer group called FLATS: Friends of Lands, Aquatics, Trails and Shellfish, with 150 members from the community. They are young and old, men and women, boy scouts and military veterans, all of whom assist the Department of Natural Resources (DNR) on a variety of coastal projects. DNR also uses summer interns from the local regional high school and Cape Cod Community College, as well as individual placements through AmeriCorp.

**Youth engagement:** The Town proposes to use seasonal interns who will assist APCC and CLE with monitoring, project outreach and project documentation.

**Monitoring and Measuring Performance:** Long term, the primary performance measures for Brewster's coastal resiliency planning efforts will be:

- Board of Selectmen's adoption of Coastal Resiliency Plan
- Update of Multi-hazard Mitigation Plan
- Integration of results into our local Emergency Management Plan
- Town Administrator's integration of project priorities into the capital budget
- Board of Health review of regulations relative to septic drain field depth to groundwater (sea level rise and storm surge), setbacks from ocean, as well as fertilizer/nutrient regulations.
- Planning Board is working on a fertilizer/nutrient bylaw, to be based on Dept. of Agriculture's new fertilizer regulation, possible adjustment of minimum lot size for areas close to the shore to limit coastal development and while allowing for greater setback distances. The data developed in this project will identify areas of higher risk along the coastline and guide future floodplain bylaws and regulations.
- Conservation Commission review of existing setbacks from beaches, dunes and coastal wetlands specified in local wetlands protection regulations to address sea level rise and storm surge, possible rebuilding restrictions. Enforcement of setback distances would be critical to their effectiveness.

**Return on Investment** The greatest return on investment will be the reduction or elimination of storm-related damage to life, property and natural and cultural resources within the project area. Management strategies based on the findings from this study will increase the resiliency of ecosystem services of the Town's natural resources. These two points will also contribute to the continuation of tourism revenues into the local communities. In addition, there will be a reduced need for Town investments for repairs.

**Risk:** The probability of substantial project failure is low. Brewster is enormously invested in its coastal resources and citizens are aware that if these resources are not well managed, the Town will experience environmental degradation and economic losses. Brewster has an excellent record of implementing environmental projects as demonstrated by its success in implementing many restoration and protection projects and as demonstrated by the 2011 Coastal America Partnership award for the Stony Brook restoration project. Brewster Town government, citizens and businesses have a record of supporting environmental protection, as evidenced by numerous Town meeting votes supporting land acquisition for conservation and environmental projects.

#### **SECTION 4. TRANSFERABILITY OF PROPOSED PROJECT**

- **Leveraging:** The coastal sediment budget methodology was initially developed and applied to the Outer Cape coast and then to the Wellfleet and Truro coast of Cape Cod Bay, north of Brewster, with funding from the National Park Service, the Island Foundation and the Massachusetts Bays Program, a partner on this project. This project will provide additional coverage of the shore of Cape Cod Bay. This study will be very valuable to the communities along Cape Cod Bay, in particular the towns of Orleans and Dennis, as the study includes a portion of each town's coastline. Additionally, Nickerson State Park will benefit from this project since the Park owns land and beach on Cape Cod Bay.
- The work described in this proposal will be conducted within the boundaries of the Town of Brewster, located on the north side of Cape Cod in the Commonwealth of Massachusetts. The exception is that the sediment budget analysis (Subtask 1.1) will include portions of the shoreline of the Town of Dennis to the west of Brewster, as it is a source of sediment to Brewster's shore, and will extend to the east to encompass Namskaket Creek in the Town of Orleans which is a sediment sink (Berman, 2011). Dennis and Brewster share the Quivett Creek marsh system and Orleans and Brewster share the Namskaket Marsh system.
- The Town has applied for a grant for a pilot oyster reef designed to improve resilience of a fringe salt marsh bordering a coastal dune. The data on sediment transport and future sea level rise is essential for siting and monitoring of its success.

#### **SECTION 5. DETAILED TIME-LINE:**

<b>ACTION</b>	<b>START</b>	<b>INTERIM ACTIONS</b>	<b>COMPLETION</b>
Field work at each of 10 landings: CLE Engineering	April 4, 2014	Introductory Public Meeting 7-2014	July 2014
Photo-documentation and monitoring: APCC	April 4, 2014	Late summer, winter and spring field work	Spring 2015
Sediment study start -development of historic data and surface model: PCCS	April 4, 2014	Field work – summer/fall 2014	Fall 2014
Design and permitting for coastal infrastructure-Breakwater Landing: Horsley Witten Group	April 4, 2014	Public Meetings to discuss proposed changes	Fall 2014
Design and permitting for coastal infrastructure-Mant's Landing: CLE Engineering	April 4, 2014	Public Meetings to discuss proposed changes	Fall 2014
Design and permitting for coastal infrastructure-Ellis Landing: East Cape Engineering	April 4, 2014	Public Meetings to discuss proposed changes	Fall 2014
Evaluation of effects of sea level rise on Brewster's coastal habitat: Town	winter	Produce brochures and interpretive materials to assist with public outreach based on results of studies	May 2015
Permitting for other 7 landings: Town	June 2014	Public meetings to present findings and recommendations	May 2015
The scientific reports: Sediment budget, the photo-documentation, habitat monitoring will be available	June 2014	Incorporated into public meetings spring 2015	May 2015
Coastal Atlas: CLE Engineering	June 2014	Final report by CLE	Spring 2015

## SECTION 6. DETAILED BUDGET SUMMARY

Task	Budget	Match	In-Kind
1.1 Sediment Budget	\$52,600	\$0	\$0
1.2 Engineering Analysis of 10 Landings	\$96,050	\$0	\$0
1.3 Assessment and Monitoring	\$5,000	\$10,000	\$2,000
1.4 Planning for Sea Level Rise	\$0	\$0	\$2,000
2.1 Mant's Landing Adaptation	\$35,000	\$0	\$0
2.2 Ellis Retreat and Adaptation	\$10,000	\$10,000	\$0
3.1 Breakwater Resiliency and Habitat Restoration	\$40,000	\$0	\$0
4.0 Public Outreach	\$11,350	\$0	\$4,000
5.0 Project Management	\$0	\$10,925	\$10,000
Subtotals	\$250,000	\$30,925	\$18,000
Town Match (\$)	\$50,000		
Grant Request	\$200,000		

The Town of Brewster is requesting **\$200,000** in grant funds. The Town will provide **\$50,000 in cash** match towards this grant. The Town offers **\$18,000 in In-Kind** services. The Town and partners will offer **\$30,925 in other match**, including \$10,925 in-kind services from APCC, \$5,000 in match for photo-documentation from APCC through a grant from the Eddy Foundation of Brewster; and \$5,000 in match for salt marsh monitoring directly adjacent to two of the landings, through a grant from the Eddy Foundation of Brewster; and **\$10,000** in funds allocated at the 2011 fall Town meeting for engineering of Ellis Landing. In addition, the Town will be completing stormwater infiltration for Ellis Landing Road and Ellis Landing in the fall of 2014, but this was not included in the calculations of local match above. See the attached letters from the Brewster Town Administrator, Selectmen, APCC and the APCC proposal for details. (Att. 8)

## SECTION 7. LOCAL PROJECT MANAGER AND TEAM PARTNERS

Chris Miller, Brewster Natural Resources Department Director will work with Dr. Jo Ann Muramoto, APCC Senior Scientist, to manage the project and assist with public outreach. APCC has dedicated 115 hours of Dr. Muramoto's time over one year (\$10,925) as match. The Town will provide over 250 hours for Chris Miller as match (\$10,000).

The proposed Project Team will be led by Chris Miller, the Town of Brewster Natural Resources Department Director, and Dr. Jo Ann Muramoto, the Association to Preserve Cape Cod Senior Scientist and Mass Bays Coordinator. The Team has successfully worked together on other restoration and resource protection projects. The Team has an excellent track record, having both been recognized by the Coastal America Partnership and NOAA for projects in Brewster.

### **Mr. Chris Miller, Director, Department of Natural Resources and Conservation, Town of Brewster**

Proposed role: Project Manager/Team Leader and staff support to the Brewster Coastal Committee.

Qualifications: Mr. Miller has a B.S. in Wildlife and Fisheries Biology from the University of Massachusetts, and an M.S. in Chemical Engineering from Wayne State University. Mr. Miller has a diverse background with 24 years of experience in environmental consulting, technical consulting, wildlife biology, and municipal service as a department head. He is a member of the Stony Brook Salt Marsh Restoration Project Team that was awarded one of 50 NOAA-ARRA coastal restoration grants in 2009. In 2011 he was given a Coastal America Partnership award in for the Stony Brook restoration project and NOAA's Excellence in Restoration Award. In 2013 the Brewster Conservation Trust selected the Brewster Department of Natural Resources as its Conservationists of the Year. Chris, his department staff and their volunteer group of 150 people will be closely involved in the proposed project. Chris was the Project Manager for the Route 6a culvert replacement project, the Freemans Pond culvert replacement project, and the Stony Brook Mill Dam Rehabilitation project, all of which occurred simultaneously with multiple engineering firms and contractors, including federal reporting to NOAA and NRCS.

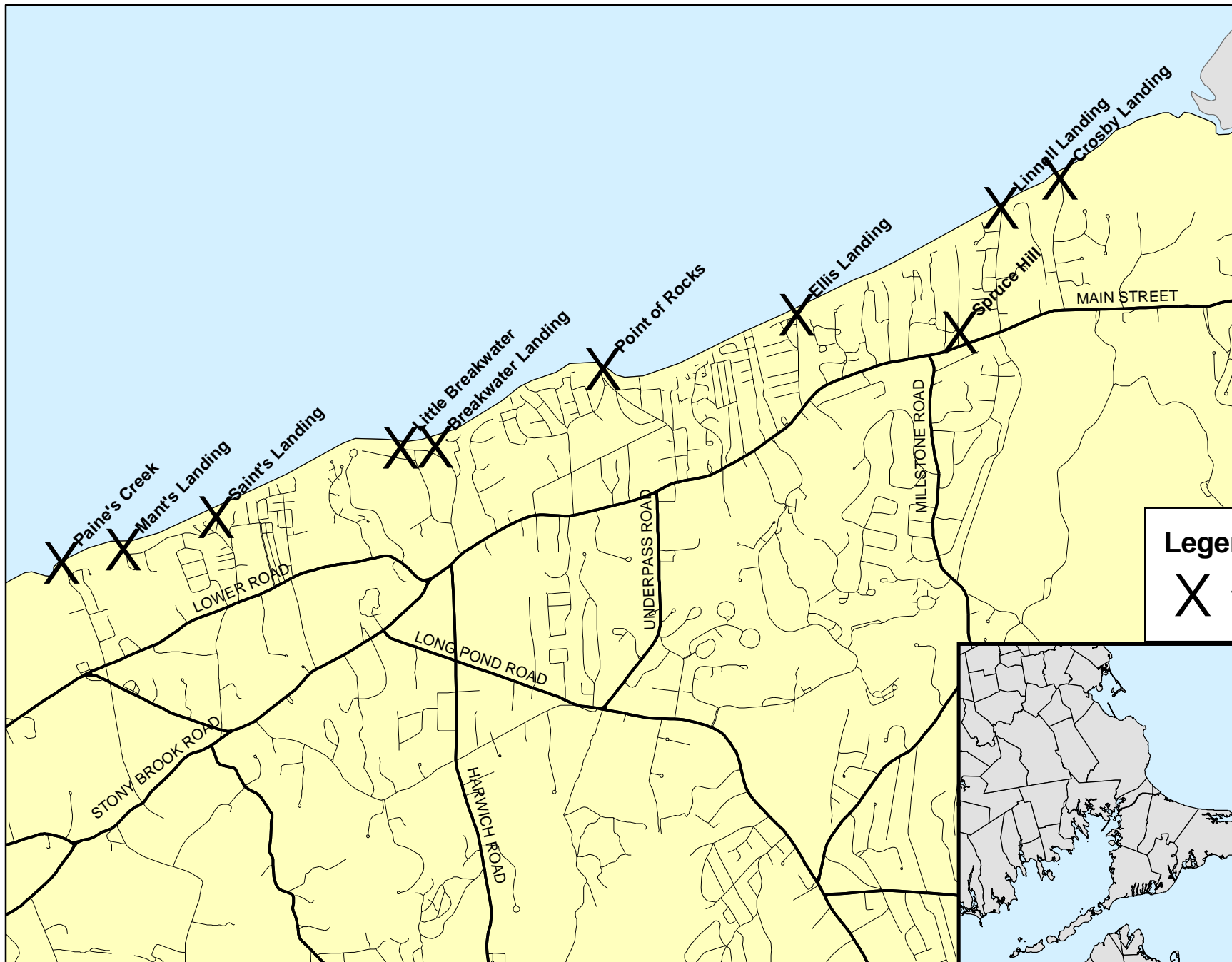
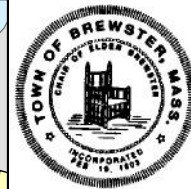
**Dr. Jo Ann Muramoto, Senior Scientist, Association to Preserve Cape Cod (APCC), and Massachusetts Bays Program Regional Coordinator for Cape Cod**

Proposed role: partner in Project Team, overseeing APCC monitoring tasks, and member of the Brewster Coastal Committee.

Qualifications: Dr. Muramoto has 32 years of experience in coastal and wetlands science, regulation, management and policy. She has a B.S. in biology from Caltech and a Ph.D. in geological sciences from Cornell University. Her work experience includes a postdoctoral position at Woods Hole Oceanographic Institution, environmental and marine consulting, and conservation administrator for the Town of Falmouth. She is a member of the Stony Brook Salt Marsh Restoration Project Team that was awarded one of 50 NOAA-ARRA coastal restoration grants in 2009 and received a Coastal America Partnership award in 2011 for the Stony Brook restoration project. Jo Ann will assist the Town with project management and outreach, and oversee APCC's monitoring task. Her full resume is included with the attached APCC proposal. The Town of Brewster will hire APCC, PCCS, CLE, Horsley Witten, and East Cape Engineering to conduct various phases of this project. Resumes for key personnel anticipated to complete the proposed scope of work are attached with each proposal.

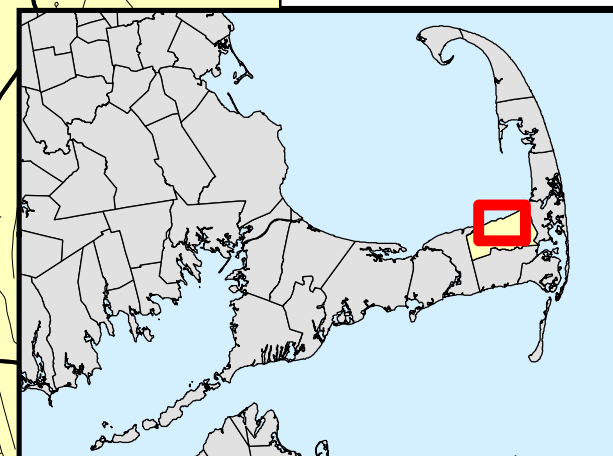
## LIST OF ATTACHMENTS:

1. Section 2. Description of Issues/Problems: Ten Public Landings
2. Section 3. Subtask 1.1. Assessment of Coastal Sediment Budget to Identify Resilient Coastal Habitat: Provincetown Center for Coastal Studies
3. Section 3. Subtask 1.2. Engineering Analysis of 10 Public Landings: CLE Engineering
4. Section 3. Subtask 1.3. Assessment and Monitoring of Natural Systems: Association to Preserve Cape Cod
5. Section 3. Subtask 2.1. Adaptive Management of Mant's Landing: CLE Engineering
6. Section 3. Subtask 2.2. Planning and Design for Managed Retreat at Ellis Landing: East Cape Engineering Proposal
7. Section 3. Subtask 3.1. Relocation of Breakwater Landing Beach Parking Area, Restoration of Beach and Dune Habitat, Green Stormwater Infrastructure: Horsley Witten Group
  
8. SUPPORT LETTERS
  - 1a. Charles L. Sumner, Town Administrator – Match Acknowledgement
  - 1b. Charles L. Sumner, Town Administrator – Notarized Signature
  2. Letters of Support:
    - 2a. Brewster Board of Selectmen
    - 2b. Paul C. Wightman, Chairman, Brewster Conservation Commission
    - 2c. Lemuel Skidmore, MS, MPH, Chair, Brewster Comprehensive Water Planning Committee
    - 2d. Richard Judd, Vice-Chair, Brewster Planning Board
    - 2e. Susan M. Leven, AICP, Town Planner
    - 2f. Robert Moran, Chief, Brewster Fire & Rescue Department
    - 2g. Richard J. Koch, Jr., Chief, Town of Brewster Police Department
    - 2h. Ms. S. Kyle Hinkle, Executive Director, Brewster Chamber of Commerce
    - 2i. Ed DeWitt, Executive Director, APCC - Association to Preserve Cape Cod
    - 2j. Claire Gradone, Chair, Brewster All Citizens Access Committee
    - 2i. Hal Minis, President, Brewster Conservation Trust



### Legend

X Town Landings



Town of Brewster  
Conservation Department

Brewster Town Landings  
Parking Areas

0 1,500 3,000 6,000 Feet  
1 inch = 3,000 feet

N



Brewster Town Landings Shoreline Change  
James M. Gallagher  
Brewster Conservation Administrator  
1/29/2010

In an effort to understand the erosion rates at the various Town Landings and parking lots in the Town of Brewster, the Massachusetts CZM Shoreline Change Project [http://www.mass.gov/czm/hazards/shoreline\\_change/shorelinechangeproject.htm](http://www.mass.gov/czm/hazards/shoreline_change/shorelinechangeproject.htm) was reviewed. Specifically, the shoreline change transects at the town landings were reviewed. Starting with Paine's Creek Landing which is the furthest west and working towards Crosby Landing which is the furthest east. The following table shows CZM's erosion rates at the landings and at the transects located immediately to the west and east of the landings. Elevations are approximate. Also see attached GIS map.

Landing/Beach	CZM Transect #	Erosion Rate (ft/yr)	West Rate	East Rate	Notes	Elevation of Parking Lot
Paine's Creek Landing	10698	-2.33	-1.15	-1.05	Highest Erosion Rate	8-10'
Mant's Landing (formerly Robbins Hill)	10708, 10709	-2.1, -1.97	-2.1	-1.84	Two Transects, High Erosion Rate	10-12'
Saint's Landing	10725	-0.43	-0.72	-0.16		22-26'
"Little Breakwater"	10759	-0.62	-0.95	-0.56		20'
Breakwater Landing	10764, 10765	-0.33, -0.39	-0.03	-0.07	Two Transects	10-12'
Point of Rocks	10795	-0.66	-0.33	0.69	Accreting to east	16-20'
Ellis Landing	10832	-0.66	-0.82	-0.56		10-14'
Spruce Hill	10861	-0.39	-0.36	-0.49	Parking is approx. 2,000 feet landward	60-62'
Linnell Landing	10870, 10871	-0.26, -0.62	-1.08	-0.26		12-16'
Crosby Landing	10880, 10881	0.49, 0.85	0.26	1.05	Two Transects, Accreting	10-12'

Paine's Creek Landing clearly has the highest erosion rate at -2.33 ft/year. Paine's Creek Landing is also at the lowest elevation. Mant's Landing also has a high erosion rate and low elevation.

Breakwater Landing and Ellis Landing have lower erosion rates, but are still located at low elevations and the parking areas have recently been damaged by high tides and

storms. The erosion rate to the west of Breakwater is deceiving. The rate is low (-0.03), because there is a stone revetment to the west of Breakwater Landing.

Saint's Landing, Point of Rocks, and Linnell Landing currently have some protection due to dune formations seaward of the parking areas.

'Little Breakwater' is located near the top of a coastal bank which is eroding.

Spruce Hill and Crosby Landing are the parking areas that are the least in danger. Spruce Hill's parking area is located almost half a mile landward of the beach. The beach is at the end of a long trail through a conservation area. Crosby Landing has actually been accreting sand.



## **Sediment Budget Analysis – Sesuit Harbor, Dennis, Massachusetts to Namskaket Creek, Orleans, Massachusetts**

### **Center for Coastal Studies**

In order to better understand sedimentation processes along the Brewster shore and address pressing coastal management issues, the Center for Coastal Studies (CCS) will quantify sediment movement for the segment of the Cape Cod Bay shoreline extending from Sesuit Harbor in Dennis east along the Brewster coast to Namskaket Creek in Orleans (the study area). Namskaket is known to be an area of sediment deposition, based on the littoral cell description by Berman (2011). This work will characterize the natural dynamics of this system, providing an assessment of sediment transport and sediment budget calculations for approximately 11.3 km (7 miles) of shoreline. To quantify the longshore sediment transport rates, sediment sources and sinks, and littoral cell boundaries, a simple geomorphic model (Giese, et al., 2011), based on the conservation of mass, coastal wave mechanics, and the coastal morphodynamic concept of transport within littoral cells, will be applied as demonstrated in previous CCS work (Giese, et al., 2012, Giese, et al., 2013, Giese, et al., 2014).

#### **Task 1: Development of Historical Geospatial Data**

As described in Task 2 below, the hydrographic work of the United States Coast & Geodetic Survey (USC&GS) performed during 1933 and 1934, supplemented with historical topographic information of the relatively small land areas subject to marine and coastal processes will be used to compile an historical surface model for quantitative comparison with a contemporary surface model derived from LiDAR. The 1930s USC&GS hydrographic work is related horizontally to the North American Datum of 1927 (NAD27) and vertically to local mean low water (MLW). Those historical data will be translated into contemporary horizontal and vertical reference systems. As demonstrated on related projects, an accurate translation from NAD27 to the contemporary North American Datum of 1983 (NAD83) is well documented (Giese et al, 2010; Giese et al, 2009). Vertical translations from a local MLW datum to a contemporary geodetic datum such as the North American Vertical Datum of 1988 (NAVD88) are geographically-specific, however, requiring the acquisition of historical benchmark information and field work to determine reliable conversions. To ensure accurate comparisons of elevation data, recent methodology developed and documented as part of PCCS's Marindin project, will be utilized to relate historical soundings and elevations to a contemporary vertical datum (Mague, 2012). The resulting product will be a comprehensive data set of historical geospatial data related horizontally to NAD83 and vertically to NAVD88.

#### **Task 2: Historical Surface Model Development**

The datum-translated historical data developed in Task 1 will be used to create a 3-dimensional surface of the study area for comparison with the contemporary surface created in Task 3. To create this surface, the translated longitude, latitude and elevation (x,y,z) data from each point will be extracted and used to create a digital database of all historical point information. Data from these points will be used to create a point shapefile within the ARCGIS v10.0 software suite and these points will then be converted into a Triangulated Irregular Network (TIN) using the 3-D analyst extension with ARCGIS to generate a real-world surface. Based on the translations developed in Task 1, the surface will relate horizontally to NAD83, meters and vertically to NAVD88, meters.

### **Task 3: Contemporary Surface Model Development**

A contemporary surface model of the study area will be produced using bathymetric data from PCCS's Nearshore Seafloor Mapping Project and bathymetric and topographic LiDAR data (2011) from the U.S. Army Corps of Engineers. As with the historical surface, the contemporary surface will relate horizontally to NAD83, meters and vertically to NAVD88, meters. Since an approximately 6 square mile offshore area north of the Namskaket area is not covered by bathymetric LiDAR, CCS will use its survey vessel the R/V *Marindin*, equipped with seafloor mapping equipment, to acquire the necessary bathymetric data along appropriate transects.

### **Task 4: Transect Construction**

Based on the surface models developed in Tasks 2 and 3, transects will be constructed along the 11.3 km shoreline comprising the study area. As the initial step in this task, a baseline will be defined to which all transects will be related. As with previous studies, to minimize potential influences of anthropocentric and other non-related processes on study results, the baseline will be established at the estimated landward limit of the area contributing sediment to marine and coastal transport. Where possible the baseline location will include features common to both historical and contemporary surfaces (e.g., street intersections, railroad right of way) to facilitate field checks of elevations and verification of the surface models. After a suitable baseline has been developed, an estimated 75 shore perpendicular transects will be constructed at approximately 150 meter intervals and extend offshore about a mile to the approximate 6 m depth. Due to the extensive nature of the tidal flats, actual transect lengths will be adjusted during the initial phases of the analysis. Once transect locations have been defined, comparative profiles (*x, y, and z data*) for the historical and contemporary surfaces will be constructed for each transect and exported as EXCEL spreadsheets to form the basis for volumetric analysis in Task 5.

### **Task 5: Volumetric Analysis**

Applying the geomorphic model and using the spreadsheet information generated in Task 4, MATLAB software will be used to compare the 1933/34 and contemporary profiles to determine the area between them. Further analysis will provide estimates of the annual change in sediment volume per unit distance along the shore, and the annual change in net longshore sediment transport (longshore flux) at each transect location. The distribution of the change in longshore flux along the shoreline will permit the location of the "null points" (points of no net longshore flux) within the zone of active sediment transport. From this information, an estimate will be made of the overall sediment budget (including the location of sources and sinks), the net direction of longshore sediment transport, and the volume-rate of that transport.

### **Task 6: Report and Recommendations**

A final a project report will be prepared describing the methodology used and the quantitative results of this study. The report will include a discussion of shoreline change over the last 80 years for the study area, identify high erosion areas and sources and sinks of sediment and provide recommendations for coastal managers responsible for developing responses to climate change and sea level rise.

<b>Labor Costs:</b>	<b>Hr. rate</b>	<b>Hours</b>	
Senior Scientist	88.27	204	18,006.92
Associate Scientist	66.20	76	5,031.35
Adjunct Scientist II	57.38	288	16,524.00
Research Associate II	44.13	32	1,412.31
Intern	22.07	280	6,178.85

**Total Labor:** **\$ 47,153.42**

**Estimated Total Project Cost:** **\$52,660**

CURRICULUM VITAE  
**GRAHAM SHERWOOD GIESE**

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Provincetown Center for Coastal Studies  
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5 Holway Avenue  
Provincetown, MA 02657

EDUCATION:

University of Chicago, Ph.D. Department of Geophysical Sciences 1966  
University of Rhode Island, M.S. Graduate School of Oceanography 1964  
Trinity College, Hartford, CT, B.S. 1953

PROFESSIONAL POSITIONS:

Senior Scientist (2004 - present)  
Provincetown Center for Coastal Studies, Provincetown, MA

Oceanographer Emeritus (1997 - present)  
Woods Hole Oceanographic Institution, Geology and Geophysics Department

Research Specialist (1987 - 1996)  
Woods Hole Oceanographic Institution, Geology and Geophysics Department

Guest Investigator/Visiting Investigator (1985-1987)  
Woods Hole Oceanographic Institution, Geology and Geophysics Department

Associate Director (1983-1985) and Adjunct Professor (1983-1987)  
Marine Sciences Research Center, SUNY, Stony Brook, NY

Senior Scientist (1981-1983) and Executive Director (1979-1982)  
Provincetown Center for Coastal Studies, Provincetown, MA

Associate Scientist (1976-1981)  
Provincetown Center for Coastal Studies, Provincetown, MA

Associate Scientist (1972-1976)  
Marine Consulting Associates, Inc., Provincetown, MA

Associate Professor (1970-1972)  
University of Puerto Rico, Department of Marine Sciences

Assistant Professor (1967-1970)  
University of Puerto Rico, Department of Marine Sciences

Assistant Scientist (1967)

Woods Hole Oceanographic Institution, Geology and Geophysics Department

Research Assistant (1956-1962)

Woods Hole Oceanographic Institution, Department of Geology

## PUBLICATIONS

Author of more than 80 scientific publications and reports in the fields of Coastal Geology and Coastal Oceanography

## PROFESSIONAL AFFILIATIONS:

American Geophysical Union

Geological Society of America

Estuarine Research Federation

Coasts Oceans Ports and Rivers Institute

## REFEREED PUBLICATIONS:

1960 Zeigler, J.M., W.S. Hoffmeister, G.S. Giese and H.J. Tasha, Discovery of Eocene sediments in subsurface Cape Cod. *Science*, v. 132, n. 3437, p. 1397-1398.

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1965 Zeigler, J.M., S.D. Tuttle, G.S. Giese and H.J. Tasha, The age and development of the Provincelands Hook, Outer Cape Cod, Massachusetts. *Limnology and Oceanography*, v. 10, p. R298-R311.

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2009 Giese, G.S., M.B. Adams, T.L. Keon, S.T. Mague and S.S. Rogers, Observations of a pre-migration phase in a tidal inlet migration "cycle". Northeast Beaches Conference, Northeast Shore and Beach Preservation Association, 21-23 September, Woods Hole, MA.

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2011 Giese, G.S., Coastal sediment transport on Outer Cape Cod, Massachusetts: observation and theory. Massachusetts Association of Land Surveyors and Civil Engineers Conference, 23-24 September, Hyannis, MA.

PROFESSIONAL EXPERIENCE/EDUCATION:

I have designed academic programs, designed and taught graduate and undergraduate courses, served on graduate committees, and advised students of marine science at the University of Puerto Rico, the State University of New York at Stony Brook, and Northeastern University, and I have been a co-instructor of the WHOI/MIT Joint Program course, "Marine Geology and Geophysics". In addition, I have frequently lectured on Marine Geology and Oceanography in programs designed for the general public.

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## PROFESSIONAL POSITIONS

- 01/2011 – Present** Associate Scientist, Chair, Dept. of Marine Geology, Center for Coastal Studies, Provincetown, MA
- 06/2010 – Present** Director, Seafloor Mapping Program, Dept. of Marine Geology, Center for Coastal Studies, Provincetown, MA
- 01/2010 – Present** Adjunct Professor, Dept. of Environmental Sciences, Cape Cod Community College
- 09/2009 – Present** Adjunct Professor, Dept. of Environmental, Earth and Ocean Sciences, University of Massachusetts-Boston
- 06/2009 – 05/2010** Assistant Scientist, Project Manager: Cape Cod Bay Seafloor Mapping Project  
Dept. of Marine Geology, Center for Coastal Studies,  
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- 03/2007 – 05/2009** Coastal Geologist, Dept. of Recreation, Park and Tourism Sciences; Texas A&M University. Duty-Station: US National Park Service, Geologic Resources Division, Lakewood, CO
- 06/2003 – 08/2005** Coastal Geologist, Massachusetts Office of Coastal Zone Management, Boston, MA

## EDUCATION

- 2008 Ph.D. University of Rhode Island**
- 2001 M.S. University of North Carolina at Chapel Hill**
- 1999 B.S. Tufts University**

## PUBLICATIONS (\*denotes student author)

### Published, Peer-Reviewed Journals and Conference Proceedings

1. **Borrelli, M.**, Gontz, A.M., Smith, T.L., Shumchenia, E. J., Wilson, J.R., Giese, G.S. (2013). Progress map of the onshore-offshore surficial geologic map of the North Truro Quadrangle, Barnstable County, Massachusetts. 1:24,000. Massachusetts Geological Survey, Open File Report. 2013-01. 1 sheet and digital product: Adobe PDF and ESRI ArcGIS database.
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- Borrelli, M.**, Giese G.S., Dingman, S.L., Gontz, A.M., Adams, M.B., Norton\*, A.R., Brown\*, T.L.B., (2011). Linear Scour Depressions or Bedforms? Using Interferometric Sonar to Investigate Nearshore Sediment Transport. Abstract OS13B-1536 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 05-09 Dec
- Norton\*, A.R., Trembanis, A.C., Brown\*, T.L.B., **Borrelli, M.**, (2011). Mapping and quantifying morphological parameters of eelgrass (*Zostera marina*) beds in eastern Cape Cod Bay, MA using an interferometric sonar system. *21st Biennial Conference of the Coastal and Estuarine Research Federation. Societies, Estuaries and Coasts: Adapting to Change*. 6-10 November 2011, Daytona Beach, Florida.
- Borrelli, M.**, Brown\*, T.L., Norton\*, A.R., (2011). Marine Mapping for Managers in Ocean and Coastal Parks: Making it Possible with Partnerships. *Proceedings, George Wright Society Conference, March 14-18, 2011*, New Orleans, LA.
- Brown\*, T.L., Norton\*, A.R., **Borrelli, M.**, Gontz, A. (2011). Shallow water benthic habitat maps for resource managers: The technology and the science. *Proceedings, George Wright Society Conference, March 14-18, 2011*, New Orleans, LA.
- Nichols, O.C., Lind, H., Baldwin, J., Jackett, T., **Borrelli, M.**, Small, P. (2010). Site selection for subtidal aquaculture development areas: a comprehensive habitat mapping approach. *Northeast Aquaculture Conference and Exposition. Plymouth MA*, December, 2010.
- Borrelli, M.**, Brown\*, T.L.B., Norton\*, A.R. (2010). Marine Mapping in Coastal National Parks: Management, Science and Technology. *Geological Society of America Abstracts with Programs*, vol. 42, no. 5, p. 563
- Borrelli, M.** (2010). The efficacy of interferometric sonar to map the seafloor in very shallow waters: Cape Cod National Seashore and vicinity, *Geological Society of America Abstracts with Programs*, vol. 42, no. 1, pp. 103.
- Borrelli, M.**, Boothroyd, J.C., (2008). The Role of a Flood-Tidal Delta in the Evolution of a Tidal Inlet: Chatham Harbor, Cape Cod, Massachusetts, *Geological Society of America Abstracts with Programs*, Vol. 40, No. 6, p. 92.
- Borrelli, M.**, Boothroyd, J.C., (2008). Documenting Change Along a Low-Energy Coastal Embayment with Fringing Marsh: A New Proxy-Based Shoreline Indicator. *American Geophysical Union, Ocean Sciences Meeting*, Orlando, FL, March 2008.
- Borrelli, M.**, (2007). Storm Vulnerability Assessments and Management Implications in Ocean and Coastal National Parks. *The State of the Science for Assessing and Mapping Coastal Hazards, The First Cullowhee Coastal Conference*. Western Carolina University, Cullowhee, North Carolina.
- Borrelli, M.**, (2006). The Development of a New Method to Predict Inlet Evolution: Links Between Flood-Tidal Delta Morphology and Inlet Configuration: *Association of Environmental and Engineering Geologists*,
- Borrelli, M.**, Boothroyd, J.C., Oakley, B.A., (2005). Historic and present-day hydrodynamics of intertidal bedforms in a coastal lagoon: photogrammetric analyses and field surveys: *Geological Society of America Abstracts with Programs*, Vol. 37, No. 1, p. 0
- Borrelli, M.** (2002). Sediment bypassing and progradation downdrift of a wave-attenuating jetty. *Proceedings of the Northeast Shore and Beach Preservation Association Conference*, Woods Hole Oceanographic Institution. October, 2002.
- Wells, J.T., McNinch, J.E., Park, J.Y., **Borrelli, M.**, Freeman, C. W., (2002). A decade of research at the Cape Lookout cusped foreland: new insights into longshore transport, shoal evolution, spit growth and the regional sediment budget: *EOS Trans. AGU*, 83(47), Fall Meet. Suppl., Abstract

OS52F-07, 2002.

**Borrelli, M.** and Wells, J.T., (2001). Large-scale volume change and progradation of Power Squadron Spit during a transgression at Cape Lookout, North Carolina: *Geological Society of America Abstracts with Programs* Vol. 33, No. 2, March 2001.

McNinch, J.E., Freeman, C.W., Bernstein, D., **Borrelli, M.**, (2001). The influence of cusate forelands on regional circulation, sediment budgets, and carbon cycling: An overview of results: *Geological Society of America Abstracts with Programs* Vol. 33, No. 6, October 2001.

**Borrelli, M.** and Wells, J.T., (2000). Welding swash bars and progradation during a transgression: Cape Lookout National Seashore, North Carolina: *Southeast Geological Society of America Abstracts with Programs* Vol. 33, No. 6, October 2000.

### **Invited Talks**

**Borrelli, M.** 2013. Led panel discussion after screening of *Chasing Ice* at the Science-on-Screen mini-festival, as part of the Provincetown Film Festival 2013. Funded by the Alfred B. Sloan Foundation and conducted by the Coolidge Corner Theatre Foundation, Brookline MA.

**Borrelli, M.**, Norton, A. R., Brown, T.L.B., (2010). Nearshore Seafloor Mapping in Cape Cod Bay, Massachusetts. *New England Estuarine Research Society*, Provincetown, MA, October 27-30, 2010.

**Borrelli, M.**, (2010). Cape Cod Bay Mapping Project—Mapping the shallow waters in Cape Cod Bay, Massachusetts. National Oceanic and Atmospheric Administration's Hydrographic Services Review Panel meeting in Providence, RI, May 5-6, 2010.

**Borrelli, M.**, Boothroyd, J.C., (2008). Implications of Management Practices in Park-Adjacent Areas: New Inlet Formation in Cape Cod National Seashore *Geological Society of America Abstracts with Programs*, Vol. 40, No. 6, p. 186

**Borrelli, M.**, (2006). Cape Cod to Cape Lookout: Coastal Processes, Policy and Management Along two Barrier Island Chains. *Institute for the Coastal Marine Environment*. Naples, Italy. October, 2006.

**Borrelli, M.**, (2006). Predicting Inlet Evolution Using Rectified Aerial Photographs and Field Surveys. *Pleasant Bay Symposium 2006: Understanding and Managing a Dynamic Coastal System*. Chatham, Massachusetts.

### **Chaired Sessions:**

**Borrelli, M.**, Schupp, C. (2010). Coastal and Nearshore Processes Affecting Our National Parks, Combined Northeastern / Southeastern *Geological Society of America Meeting*, Baltimore, Maryland, 13-16 March 2010.

**Borrelli, M.**, (2009). Storm Response and Recovery in Ocean and Coastal Parks. *George Wright Society Biennial Conference. Doubletree Hotel, Portland, Oregon, 2-6 March, 2009.*

**Borrelli, M.**, Beavers, R., (2007). Assessing Storm Hazards in Vulnerable Areas of the National Park Service. *George Wright Society Biennial Conference. Crowne Plaza Hotel, St. Paul, Minnesota, 16-20 April, 2007.*

### **PROFESSIONAL ASSOCIATIONS**

- Geological Society of America
- American Geophysical Union
- International Association of Sedimentologists

### **BOARDS AND MEMBERSHIPS**

- State Geologic Mapping Advisory Committee: Massachusetts
- Pleasant Bay Alliance, Coastal Work Group





February 19, 2014

Mr. Chris Miller  
Director, Natural Resource Department  
Town of Brewster  
2198 Main Street  
Brewster, MA 02631

Via E-mail

**RE:** Coastal Community Resilience Grant Budget

Dear Mr. Miller,

CLE Engineering, Inc. (CLE) is pleased to provide the following response to your request for budget values for use in your submittal of the Town of Brewster's application for the Coastal Community Research Grant. CLE has provided budget estimates for each of the Tasks as requested in your e-mail dated February 11, 2014. I have broken the requested Tasks into two separate projects and retained the references (in parentheses) you used for each task in the e-mail.

Project 1 (2a): Mants Landing – Design, Permitting and Preparation of Bid Documents

Task 1: Design: \$12,100

Task 2: Environmental Permitting: \$12,500

Task 3: Final Design and Specifications: \$10,400

**Total: \$35,000**

Assumptions:

1. A topographic survey will be performed using a Real Time Kinematic (RTK) Global Positioning System (GPS) with a stated horizontal and vertical accuracy of 2.5 cm.
2. The design will **not** include a boat ramp.
3. The design will include Articulating Concrete Mats and a boardwalk.
4. Soil samples will be obtained for grain size analysis for use in geotechnical analysis.
5. A site plan of the design will be prepared and presented at a public meeting in Brewster prior to preparation and submittal of permit applications.
6. The plans and applications will be prepared and submitted for the following permits:
  - a. MEPA ENF and Scoping Session for alteration to coastal dune
  - b. DEP Chapter 91 for work below Mean High Water will **not** be required
  - c. Corps of Engineer for work below Annual High Tide Line will **not** be required
  - d. Notice of Intent (assumes 2 hearings)
  - e. Associated expenses such as filing fee to MESA if needed, certified mail and legal ads are included.
7. The Final Construction Plans and Specifications will be prepared upon receipt of all permits and provided to Brewster for their administration of the bid process and contract

award.

8. Construction oversight services are **not** included in the budget.

Project 2 (2b) Engineering Analysis of ten (10) public landings

Task 1 Field Work: \$35,650

Task 2 (2c): Draft Assessment and Planning Recommendations with Incorporation of Town's Comments as Preferred Option: \$25,500

Task 3 (2d): Three (3) Public Meetings and One (1) Meeting with the Provincetown Center for Coastal Studies: \$5,000

Task 4 (2e): Preparation of Monitoring Schedule/Scope of Work: \$7,150

Task 5 (2f): Preparation of Notice of Intent for Each of Seven (7) Sites based on Preferred Option for Ongoing Maintenance and Nourishment: \$11,900

Task 6 (2g): Preparation of Final Beach and Landing Atlas

With Recommendations: \$10,850

**Total: \$96,050**

Assumptions:

1. It is assumed the field work including the topographic survey and existing conditions site plan from Project 1 above will be used for the analysis of Mants Landing. Additional field topographic survey work will be performed on the remaining nine (9) sites with the exception of Mants Landing.
2. A topographic survey will be performed at the nine (9) sites using a Real Time Kinematic (RTK) Global Positioning System (GPS) with a stated horizontal and vertical accuracy of 2.5 cm. It is assumed the average length of beach frontage at the existing structures is 250' and beach transects will be surveyed on 25' centers.
3. Wetland resources will be delineated on each of the seven (7) sites; it is assumed the wetland resources will have been delineated for the NOI on Ellis Landing and Breakwater Beach prepared by others and will be provided.
4. Soil samples will be obtained from each of the seven (7) sites for grain size analysis for use in geotechnical analysis. It is assumed the grain size analysis from Ellis Landing and Breakwater Beach will be provided by others.
5. A Benchmark (BM) will be set to provide vertical control on each of the seven (7) sites; it is assumed the BM from Ellis Landing and Breakwater Beach established by others will be provided.
6. A review of available resource reports/assessments will be made. It is assumed the Town will provide its available reports and other sources such as MassGIS, DMF, DEP, etc. will be reviewed.
7. No field work consisting of shellfish surveys, habitat identification, fisheries or other resource identification/delineation is anticipated in this budget.
8. The location and condition of the existing infrastructure at each of the ten (10) sites will

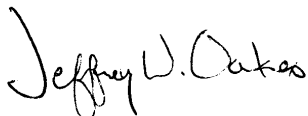
be documented.

9. A site plan of the existing conditions will be prepared for each of the ten (10) sites
10. A review of available existing conditions reports for the ten (10) sites will be made to determine rates of erosion/accretion, frequency and nature of repairs, typical residential usage types, etc.
11. Recommended actions intended to provide coastal resiliency for each of the ten (10) sites will be developed for the 5 year, 10 year and 30 year time frames.
12. A brief PowerPoint presentation on all ten (10) sites describing the above recommendations will be prepared and presented at three (3) public meetings in Brewster.
13. A list of quantifiable features at each of the ten (10) sites will be prepared and reviewed with the Town for development of a Monitoring Plan.
14. A Monitoring Scope of Work will be prepared describing the features to be measured, the methodology to be used and the frequency of the measurements.
15. It is assumed the Town will be responsible for execution of the Monitoring Plan at all ten (10) sites.
16. Seven (7) Notice of Intent (NOI) filings will be prepared for the seven (7) sites for the ongoing maintenance and nourishment work to be done in accordance with the planning recommendations described above (Task 11).
17. It is assumed the seven (7) NOI filings will be presented to the Conservation Commission at two (2) public hearings.
  - a. Associated expenses such as filing fee to MESA if needed, certified mail and legal ads are included.
18. A Final Beach and Landing Atlas will be prepared for each of the ten (10) sites. It will contain a description of existing conditions, site plans, Monitoring Plan, recommendations for the 5 year, 10 year and 15 year time frames and all permits.

I trust you will find this budget breakdown of the costs to provide the services described in your February 11, 2014 e-mail useful in the preparation of your Grant request.

Please contact me with any questions.

Very Truly Yours,  
CLE Engineering, Inc.



Jeffrey W. Oakes, P.E.  
Senior Project Manager

**JEFFREY W. OAKES, P.E.**

**Senior Project Manager**

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**EDUCATION:**

B.S., Engineering, 1985  
*Michigan Technological University, Houghton, Michigan*  
 B.S., Biological Sciences, 1980  
*Michigan Technological University, Houghton, Michigan*

**PROFESSIONAL REGISTRATIONS**

Registered Professional Engineer, Civil Engineering  
 Massachusetts License # 35874  
 New Hampshire License # 8561  
 Vermont License # 018-0007005  
 Maine License # 7628  
 Connecticut License # 00017812  
 Pennsylvania License # PE-044525-R  
 New Jersey License # GE-38837

**PROFESSIONAL AFFILIATIONS:**

Marion, MA Conservation Commission  
 New England Estuarine Research Society  
 Rhode Island Society of Environmental Professionals  
 Certified SCUBA Diver  
 Rhode Island Certified Invasive Manager  
 Rhode Island Low Impact Development Master Design  
 Certification

**RESPONSIBILITIES:**

Mr. Oakes has over twenty five years experience in wetland resource identification and assessment related to site engineering of coastal and inland projects for private, commercial, and public concerns. He is responsible for the initial identification of environmental constraints, obtaining local, state and federal environmental permits, site layout, drainage design, and construction oversight of site development, wetland restoration, and waterfront projects.

**PROFESSIONAL EXPERIENCE:**

**Wetlands Identification, Restoration and Creation**

Mr. Oakes was responsible for the feasibility studies, wetland and aquatic resource delineation, drainage analyses, drainage structure designs, and the permit plan and application submittals for numerous wetland restoration projects including a number of Priority Project Sites under contract with the Massachusetts Office of Coastal Zone Management Wetland Restoration Program (subsequently the Division of Ecological Restoration). He developed specifications and provided construction oversight of the award winning Stony Brook Salt Marsh and Fish Passage Improvement project in Brewster, MA, the South Cape Beach project in Mashpee, MA and the Shore Road project in Yarmouth, MA. All three projects were successfully completed between 2007 and 2011. Mr. Oakes has also been responsible for the following:

Identification and mapping of sub aquatic vegetation including eelgrass for numerous projects by means of SCUBA diving and snorkeling as well as through under water videography. The eelgrass inspections were conducted for mapping as well as for monitoring purposes. Mapping and monitoring was performed in

accordance with US Army Corps of Engineers methodology and included stem counts, leaf length measurements, epiphytic coverage and observations on overall vigor.

Supervision of the design and permit application process of a 0.7 acre salt marsh restoration and culvert replacement in Quincy, MA. Provided resource identification, salt marsh restoration and culvert replacement design plans, and prepared permit applications for submittal to local, state and federal regulatory agencies. Coordinated the project with the City of Quincy, the NOAA Fisheries Restoration Center and the Massachusetts Wetlands Restoration Program.

Coordination of the restoration of approximately 27 –acres of salt marsh, Kittansett Club, Marion, MA. Worked as project co-coordinator and liaison between the Kittansett Club and the Plymouth County Mosquito Control Project. Provided technical assistance regarding the hydraulics and hydrology of the site, topographic mapping from aerial photogrammetry and regulatory issues.

Restoration of 0.48 – acre pond on a residential site in Wareham, MA. Responsible for coastal and inland resource identification and delineation using State and Federal methods. Conducted shallow water bathymetric survey using shallow draft vessel and GPS in otherwise inaccessible areas. Responsible for sediment sampling, plan preparation, and NOI, WQC, and ACOE permit applications.

Delineation of emergent aquatic wetland resources to establish the limit of dredging as part of the Hardy Pond Restoration Project for the City of Waltham, MA. Responsible for the design and preparation of the plans and specifications a pond bank wetland restoration and the enlargement of an existing wetland to enhance its stormwater treatment capabilities losses.

Completion of the FEIR and prepared the NOI, Chapter 91 and ACOE plans and permit applications for the U. S. Army Corps of Engineers Sagamore Marsh Restoration. Worked closely with the DEM, ACOE, MWRP, and the Conservation Commissions in the Towns of Bourne and Sandwich. 1997-1998.

Supervision of the development of the multi – acre wetland creation plans on two sites as part of the NH DOT reconstruction of Exit 13 on I-93. 1998.

Development of wetland creation plans for numerous floodplain and stream bank locations on the site as mitigation for the Knox County Airport expansion in Rockland, ME. 1995.

Performance of a hydrologic and pollutant loading analysis of the Millers River for the Central Artery/Third Harbor Tunnel project in Boston. Analysis was used in functions and values assessment of the Millers River and was integral to the design of the site as a mitigation component of the Central Artery/Third Harbor Tunnel project. 1993-1994.

Identification and delineation of numerous wetlands throughout Massachusetts for industrial, commercial, and residential subdivision and site development projects. Designed and provided construction oversight of many wetland replication and restoration projects as part of the site design process. Permit applications to Town agencies include local NOIs, earth removal permits, subdivision approvals, site plan review and Board of Heath approvals. State permit applications have included ENFs, EIRs, Water Quality Certifications, and Chapter 91 licenses and permits. 1985-present.

#### **Environmental / Regulatory Compliance Work**

Preparation of the Final Environmental Impact Report for the Sagamore Marsh Restoration Project. Managed the project under contract with the Massachusetts Department of Environmental Management, Office of Waterways. 1997

Provided technical support and assisted in the preparation of a Request for Superseding Orders of Conditions and subsequent Request for Adjudicatory Hearings relative to wetland and stormwater impacts from projects proposed in Raynham, Foxboro and Plymouth, MA. 1996-2001

Performed water column, sediment, and air quality monitoring during dredging and disposal operations for the first phase of the New Bedford Harbor Superfund Site PCB dredging project to ensure permit compliance. 1995-1996.

Conducted site inspections of undeveloped parcels of land adjacent to the Fitchburg/Westminster Sanitary Landfill to characterize the natural resources and features of the land. Wrote the section of the Fitchburg/Westminster Sanitary Landfill Expansion EIR describing the site hydrology, soils, vegetative communities, and wildlife habitat. 2001

Provided wetland-consulting and engineering services to the Towns of Braintree, West Bridgewater, Raynham, Middleboro, Westport, and Fairhaven MA. Reviewed numerous wetland delineations and permit applications by others for completeness and accuracy. Reviewed stormwater analyses and designs for accuracy and to determine compliance with the DEP Stormwater Policy. On-going

Prepared numerous state and federal permits for waterfront construction projects, dredge permits, Department of the Army permits and Chapter 91 license applications for waterfront structures. Responsible for resource identification and delineation. On-going.

### **Civil Engineering Projects**

Project Manager for the Massachusetts section of a proposed Massachusetts to Florida marine and terrestrial subsurface fiber-optic cable installation. Responsibilities included identification and description of tasks, and development of budgets and project schedules using Microsoft Project™. Developed project plans and permits through the supervision of landsurveying subcontractors, hydrographic survey crews, subsurface exploration subcontractors, and project engineers. Responsible for conducting meetings with state agencies and the project proponent. Conducted resource identification of the marine and terrestrial routes. 2000-2001.

Conducted hydrologic and hydraulic analyses of storm drain and stream flow for municipalities and regional authorities. Projects for the US Army Corps of Engineers include a study of culvert and stormwater design practices in 20 selected communities throughout Connecticut, and a benefit update of the Saugus River tributaries and Roughans Point flood control proposal.

### **Marine / Hydrographic Projects**

Conducted SCUBA dive inspections or supervised a dive crew and project engineer during the preparation of a detailed above and below water inspection of the Motiva LLC Harbor Junction Wharf, Sprague Energy, St. Lawrence Cement, KeySpan, facilities in Providence, RI. Prepared a detailed engineering analysis report for the owners with engineered construction repair recommendations. Additionally, investigated several dredging options and prepared a Dredge Material Disposal Alternatives Analysis for approval by the Army Corps of Engineers in order for the facilities to be considered a non-federal beneficiary of the Providence River and Harbor Maintenance Dredging Project. Responsible for preparation of dredging and dredge material disposal permit applications as well as oversight of the dredging structural improvements.

Responsible for preparation of dredging and dredge material disposal permit applications, pier repair plans and various site improvements for the relocation of the RIPTA Ferry terminal to the Conley Wharf on the Providence River.

Project Engineer for the Town of Marblehead Little Harbor Maintenance and Improvement Dredging proposed by the DEM Office of Waterways. Responsible for delineation of wetland resources and the development of impact avoidance and mitigation plans. Prepared local, state and federal permit applications. 2000-2001.

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**JOHN A. DeRUGERIS, P.E.**

**Principal Engineer**

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**PROFESSIONAL REGISTRATION:**

Registered Professional Engineer  
States of Maine, New Hampshire, Rhode Island,  
Massachusetts, New York, Connecticut, Maryland, Georgia,  
Florida, Washington, Oregon and California  
Certified Inshore Hydrographer – American Congress of  
Surveying and Mapping – Nationwide.

**EDUCATION:**

Mechanical Engineering  
Temple University 1964

**PROFESSIONAL AFFILIATIONS:**

National Society of Professional Engineers  
Massachusetts Society of Professional Engineers  
Western Dredging Association  
American Bar Association, Associate Member  
The Hydrographic Society

**PAPERS & PUBLICATIONS:**

“Providing Compact DGPS-Based Survey Systems for Small Dredging Projects”,  
International Dredging Review, February 1996 Volume 15 Number 2

“Design Considerations on Small Harbor Dredging Projects”, ASCE Journal, March 1997

“Use of Precision GPS Systems for Positioning Augered Foundation Shafts”, Boston Central Artery, October,  
1999

“Use of GPS positioning systems for dredge control on Environmental Remediation Projects, Case Histories”  
WEDA 2000 – Texas A&M Dredging Conference, Warwick, RI

“Fundamentals of Accuracy Precision Dredging of Contaminated Sediments”, 2003 WEDA – Texas A&M  
Dredging Conference, Orlando, FL

“Expecting the Best and Preparing for the Worst: EARLY NEUTRALIZATION AND CLAIM AVOIDANCE IN DREDGING  
& MARINE CONSTRUCTION”, 2004 WEDA – Texas A&M Dredging Conference, Oak Brook, IL

“Use of Precision Systems for Location of Underwater Pipeline Utilities” 2005 WEDA – Texas A&M  
Dredging Conference, New Orleans, LA



Locating Existing Utility Crossings – A Critical Component of Dredge Planning - ASCE Ports 2007 Conference, Carlsbad California

CSO Sediment Removal in an Urban Tributary - 2008 WEDA – Texas A&M  
Dredging Conference, St. Louis, MO  
Papers & Publications (Continued)

Recreational & Commercial Boating Facilities – Site Analysis: A Continuing Education Program 2009

Recreational & Commercial Boating Facilities – Docking Facilities: A Continuing Education Program 2009

**Expert Witness & Depositions:** Years 2005 to 2011

Safeco Insurance Company vs. Port of Miami/ Dade County, Miami FL. Settled 2005.

Jones Inlet Marina, Inc. vs. Hydraulital, Inc., Riverhead, NY - 2007

JM Cashman, Inc. vs. Portland Pipeline Company, Portland, ME, Settled 2009.

JM Cashman, Inc. vs. United States, NY Div COE, Dredging Kill Van Kull, NY Trial May 2011.

**PROFESSIONAL EXPERIENCE SUMMARY**

Over 40 years Experience in the Engineering Field, of which 30 years was in Maritime Construction, Dredging and Dredging related Projects. Twenty years as Principal Engineer, engaged in design, consultation and management of projects related to marine construction dredging and hazardous waste remediation, including project management, contract dispute & litigation support, design, surveys, permitting, feasibility studies, cost studies, and project consulting for projects such as ocean outfall pipelines, port facilities and renovations, dredging projects, power plants, Superfund projects, shoreline rehabilitation, and heavy construction projects located throughout North America.

**PROJECT RELATED EXPERIENCE**

Mr. DeRuggeris has been heavily involved in over 300 Dredging and Marine related projects, including:

**Representative Dredging and Marine Design & Structural Projects 1980 to 2010 (\*):**

(\*) Dates outside of the noted periods are indicated for specific projects

- New Bedford Marine Commerce Terminal, New Bedford, MA
- Barge Berthing Facilities, & Multibeam Surveys Jamestown, RI
- Ferry & Mega-Yacht facilities, w/ 2000 & 200 tonne Haul-outs, Quonset Dev. Corp., RI
- Cruise Terminal & Mega-Yacht Marina & Yacht Center, Providence, RI
- Dredging, Mooring and Structural Improvements, St. Lawrence Cement, Providence, RI
- Dredging & Structural Improvements, St. Lawrence Cement facilities, Everett, MA
- Dredging & Structural Rehabilitation, Bel Marin Keys CSD, Novato, CA

- Dredging, Restoration & Bulkheading, & Travel Lift, City Marina, New Rochelle, NY
- Dredging & Bulkheading, & Travel Lift, MacDougall's Marina, Falmouth, MA
- 350' Marina Steel Sheetpile Bulkhead, Hingham, MA
- Dredging & Bulkheading, & Travel Lift, Bass River Marina, Dennis, MA
- Dredging, Piers & Bulkheading, & 400 tonne Travel Lift, Fairhaven Shipyard, MA
- Ship Mooring Study & Bollards, St Lawrence Cement, Providence, RI
- Berthing Dolphins, Dredging and Ship Mooring Systems, Canal Electric Facility, Sandwich, MA
- Reconstruction of City Pier, Port Townsend, WA
- Ferry Landing rehabilitation, & Dredging, City of Vallejo, CA
- Ferry Landing rehabilitation and Replacement, Squantum, MA
- Ferry Landing rehabilitation, Edgartown, MA
- Dredging, US Generating Plant, Providence, RI
- Contaminated Sediment Dredging, Hendrix Street Canal - NYC DEP, Brooklyn, NY
- Contaminated Sediment Dredging, Paerdegat Creek - NYC DEP, Brooklyn, NY
- Contaminated Sediment Dredging, Alameda Lagoons, Alameda, CA
- Dredging, Permitting, St. Lawrence Cement Facilities, Providence, RI
- Dredging Consulting, & Site Investigations, Keyspan Energy, Providence, RI
- Dredging, Permitting & Structural Improvements, Motiva Facility, Providence, RI
- Dredging, Permitting & Structural Improvements, Sprague Energy, Providence, RI
- Dredging & Waterfront Design & Permitting, Conley Wharf Marine Park, Providence, RI
- Dredging & Multibeam surveys - Harbor Approaches, City of Alameda, CA
- Dredging & Multibeam surveys – Novato Creek, Novato, CA
- Dredging & Multibeam surveys – Motiva Terminals , New Haven, CT & Providence, RI
- Wave Run-up & Overtopping, Flood Study, "The Glades", Scituate, MA
- Wave Run-up & Overtopping, Flood Study, Humarock Beach, Scituate, MA
- Concrete Pier Earthquake Rehab & Seismic Improvements, Harbor West, Seattle, WA
- Underwater Water Main replacement study, Hull to Georges Island, MA
- Flood Routing & Circulation & Erosion Modeling Study, Eel Pond, MA
- Puerto Nuevo River, Flood Control Project Phase 2a, San Juan, PR
- Duke Energy Submarine Pipeline Project, Salem to Weymouth, MA
- Value Engineering Study, Jamaica Bay Restoration, NYC OMB, NY
- Value Engineering Study, Flushing Bay CSO, NYC OMB, NY
- Value Engineering Study, Marine Terminal, NYC OMB/DOS, Brooklyn, NY
- Underwater Inspections & Multibeam Surveys, Sakonnet River, Tiverton RI
- Ocean County Ocean Outfall dredging and pipeline, Shipbottom, NJ (1974)
- Cape May County Ocean Outfall Dredging and Outfall, Wildwood, NJ
- Sea Isle City Ocean Outfall Pipeline, Sea Isle City, NJ
- Manahawkin Bay Crossing, Outfall Pipeline, Manahawkin, NJ (1974)
- Monmouth County Ocean Outfall Pipeline, Monmouth Beach, NJ (1976)
- Dredging, Mobil Oil Facility, East Boston, MA
- Public Pier, Public Landing and Boat Launch Facility, Everett, WA
- Electronic Sounding and Positioning System Design and Installation, Boston Outfall Diffuser Project, Boston, MA

- Dredging Piers 1 & 2 and approach channels, Rhode Island Port Authority, Davisville, RI
- Dredging of the Delaware River, Philadelphia to Trenton
- Improvement Dredging Shooters Island Reach, Staten Island, New York (1976)
- Improvement Dredging Piscataqua River, Portsmouth, NH
- Improvement Dredging Weymouth Fore River, Quincy, MA
- Improvement Dredging Gloucester & Rockport Harbors, MA
- Dredging of Connecticut River, Saybrook to Hartford
- Oil Spill Response Facility, Mobil Oil, East Boston, MA
- Master Plan, and redesign, 1000 slip marina, Port of Bellingham, WA
- Survey, Design and Permitting of over 30 coastal revetments, Dennis and Barnstable, Cape Cod, MA
- Reservoir Rehabilitation Dredging, City of Vallejo, CA
- Studies and Analysis Berthing Dolphins, Dredging and Ship Mooring Systems, Motiva Facility, New Haven, CT
- Dredging and Coastal Erosion Studies and Recommendations, Salem River, Salem, NJ
- Dredging Projects for various harbors (5), Falmouth, MA
- Deer and Nut Island Dredging and Marine Facilities, annually since 1990, Boston, MA
- Deer Island Outfall Repairs, Boston, MA
- Deer Island Outfall Damage Inspection Survey, Boston, MA
- Boston Third Harbor Tunnel, Boston, MA
- Boston Outfall Diffuser, Boston, MA
- Gas Pipeline Inspection, As Built Surveys & Reporting, Providence, RI
- City of Portland Maine, Back River Pipeline Crossing Inspections, Portland, ME
- Boston Central Artery Project, Fort Point Channel Boston, MA
- Boston Harbor Project, Phase I, Boston, MA
- 300 slip Marina Dredging and Construction, Anacortes, WA
- 200 slip Marina Dredging and Construction, Neah Bay, WA
- 240 slip Marina & Floating Breakwater Design, Permitting & Construction, Hull, MA
- 240 slip Superyacht Marina, West Palm Beach, FL
- 80 slip Marina, Lake Oswego, NY
- 150 slip Superyacht Marina, LaPaz, Baja, Mexico
- 120 slip Marina Design, Dredging & Permitting, Mashpee, MA
- Puerto Nuevo River, Flood Control Project Phase 2a, San Juan, PR
- Improvement Dredging, Port of Oakland, California

**Representative Larger Hydrographic Survey Projects 1980 to 2010 (\*):**

(\*) Dates outside of the noted periods are indicated for specific projects

- Piers 1 & 2, and approach channels, Rhode Island Port Authority, Davisville, RI
- Port Elizabeth and Port Newark, New York & New Jersey Port Authority
- USCG Marine Facilities at Governors Island, New York
- Connecticut River, Federal Channels, Old Saybrook to Hartford, Connecticut
- Mobil Oil marine facilities, and Chelsea River, Boston, MA
- Island End River, Boston, MA

- Spectacle Island, Marine Facilities, Boston, MA
- Edgartown Harbor, Edgartown, MA
- Sippican Harbor, Marion, MA
- Vermont Yankee,(4000 feet of river front) Brattleboro, VT
- River Superfund Project, New Bedford, MA
- Entrance to Hampton Beach, and Inner Harbor, Hampton Beach, NH
- Salem River, Salem, NJ
- Long Beach Island, Ocean Outfall Project, Ship Bottom, NJ
- Cape May, and Avalon Ocean Outfall Projects, Cape May County, NJ

**Hazardous Waste - Superfund- Environmental**

- Jet Propulsion Laboratory Remediation, Edwards Air Force Base, Lancaster, CA
- Mountain View Mobile Home Superfund Site, Globe, AZ
- Drake Chemical Superfund Site, Lock Haven, PA
- Site Remediation, Westover AFB, Chicopee, MA
- Hazardous Waste Remediation, Hanscom AFB, Bedford, MA

**Papers & Computer Programs**

- Methodology for precision offshore hydrographic surveys, for dredging and armor placement, Deer Island Outfall Diffuser Project, Boston, MA
- Pioneering use of GPS for precision positioning of dredges
- Use of Precision GPS for critical environmental restoration projects
- Computer Program for Wave Modeling and Run up analysis for coastal revetments

**Specialized Hydrographic Survey System Design & Installation**

- Offshore hydrographic, swell compensation and positioning system for Deer Island Outfall Diffuser
- Hydrographic Survey and Positioning System, Miami, FL
- Multi-Beam stationary hydrographic survey system for dredges

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**CHRISTINE M. PLAYER**

**Senior Project Manager**

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**EDUCATION:**

B.S., Civil Engineering  
*University of Massachusetts-Lowell, Lowell, MA*  
M.S., Civil Engineering - Geotechnical & Environmental  
*University of Massachusetts-Lowell, Lowell, MA*  
B.S., Medical Technology, 1986  
*University of Massachusetts-Dartmouth, Dartmouth, MA*

**PROFESSIONAL REGISTRATIONS:**

Engineer in Training  
Massachusetts, #15606

**AREA OF SPECIALIZATION:**

Marine/Waterfront Engineering & Construction  
Coastal Dredging  
Beach Nourishment  
Environmental Permitting

**AWARDS/COMMITTEES**

Commonwealth's Pride and Performance Award  
Technical Advisor, MA Coastal Hazards Commission

**PUBLICATIONS**

*A Dual Interface Apparatus for Testing Unrestricted Friction of Soil Along Solid Surfaces*, S.G. Paikowsky, S.M. Player, P.J. Connors. ASTM Geotechnical Testing Journal, Vol. 18, No. 2, June 1995, pp. 168-193

**RESPONSIBILITIES:**

Ms. Player joined CLE in 2010 and brings over 17 years of experience as a waterfront, geotechnical, and environmental engineer. Over the course of her career in both the public and private sectors, Ms. Player has served as an engineer, grants coordinator, project manager and principal. Her experience is quite comprehensive and includes performing/managing all surveying, engineering, environmental permitting, cost estimating and bid and construction phase services for small to very large and complex private and public waterfront projects. Ms. Player has participated in a multitude of projects involving the planning, design, permitting and construction of recreational and commercial piers and marinas, mooring fields, beach nourishment, dredging, seawalls, revetments, bulkheads and boat ramps. She has also provided her technical expertise in developing comprehensive beach management plans for state and municipal agencies responsible for the operation and maintenance of public beaches.

In addition to her professional coastal engineering experience, Ms. Player also has provided grant writing, administration and management services for many of her public clients. Since entering the private sector in 2002, she has assisted many coastal communities in obtaining over \$6.5 million in state funding through MA Department of Conservation and Recreation and Seaport Advisory Council. Her prior work as a project manager, engineer and grants coordinator at MA DCR provides her with a comprehensive understanding of obtaining state funding for waterfront projects. Ms. Player also served as a technical advisor to an ad hoc working group under the Massachusetts Coastal Hazards Commission.

**PROFESSIONAL EXPERIENCE:****Sawyer Street Rowing Pier and Float, New Bedford, MA**

Senior Project Engineer for engineering and permitting of a new pile supported pier and floating dock in New Bedford Harbor for the New Bedford Harbor Development Commission. The new facility will support rowing activities sponsored by the New Bedford Community Rowing Program. Responsibilities include oversight and coordination of topographic/hydrographic survey, evaluation of site alternatives, preparation and implementation of subsurface investigation program, development of rowing course layouts, environmental permitting, cost estimating, and construction bid documents. Construction costs are estimated at \$300,000.

**Beach Nourishment and Groin & Jetty Rehabilitation, Oak Bluffs, MA**

Senior Project Manager/Engineer for a comprehensive beach nourishment and coastal structures improvement project consisting of the placement of 43,400 cy of sand along 3,200 LF of the existing eroded shoreline at four public beaches and reconstruction/repairs to (2) existing stone jetties, (3) existing stone and (6) timber groins to contain beach nourishment material. The Oak Bluffs shoreline is sediment starved and currently experiencing erosion. Implementation of this program will provide protection to existing coastal banks, crucial public infrastructure and adjacent private properties and restore/enhance four Town beaches. Eelgrass beds are known to exist along the nearshore of the project site and monitoring efforts will be required to ensure protection of this resource area. Responsibilities include oversight and coordination of volume calculations, development of design plans, beach sediment sampling and analyses, environmental assessment of impacts, eelgrass monitoring and permitting. Construction costs are estimated at \$6 million.

**Bulkhead & Commercial Building Replacement- Mass Fabricating & Welding, Inc. New Bedford, MA**

Senior Project Manager for engineering and permitting of 140 LF steel bulkhead and 6,325 SF commercial building for a steel barge manufacturing facility located in New Bedford Harbor. Responsibilities include coordination of site survey, subsurface explorations (boring and test probes), coordination of bulkhead and building design, environmental permitting, cost estimating, preparation of construction plans and specifications. Construction costs are estimated at \$1.2 million.

**Cohasset Gulph Pier Reconstruction, Cohasset, MA**

Senior Project Engineer for the engineering and permitting required to install a new 102-ft long x 4-ft wide pile-supported timber pier, gangway and floating dock to improve access to navigable waters and support marine boatyard operations. In addition, a timber walkway will be installed along the seaward face of the existing Mill building. The project requires the anchoring of pier piles to underlying/exposed ledge and the use of helical anchors to secure the float dock.

**Hingham Shipyard Marina Pier Improvements, Hingham, MA**

Senior Project Engineer for the engineering and permitting required to perform improvements to the existing 400-ft long x 35-ft wide timber pier used for commercial fishing and recreational boating. The existing structure will require the installation of additional support piles to support an increase in loading conditions and the replacement of existing deteriorated timber support piles, cross-bracing, pile caps, and decking. Construction costs are estimated at \$ 2.5 million.

Some of Ms. Player's recently managed waterfront projects prior to joining CLE have included the following:

**Coastal Structure Improvements at the Metropolitan Yacht Club, Braintree, MA**

Project consists of replacing a 150-ft deteriorated timber bulkhead with a new slope stone revetment and timber walkway. Services provided included surveying, preliminary and final design, cost estimating, and environmental permitting and repairs to approximately 85 feet of existing stone revetment.

**Green Harbor Mooring Re-grid Plan, Marshfield, MA**

Project consisted of the re-configuration of approximately 90 moorings within Green Harbor. The mooring layout had to adequately address the needs of the commercial fishing fleet as well as recreational boaters and establish designated fairways to facilitate safe boating access in/out of the harbor and to the commercial fishing and town piers and public boat ramp.

**Secure Docking Facility for Law Enforcement, New Bedford State Pier, New Bedford, MA**

Project consisted of the installation of a new secure docking facility for MA Environmental Police Boats at the New Bedford State Pier. The proposed project was identified as a component to the U.S. Department of Homeland Security Master Plan for the MA South Coast region. The new facility includes docking capabilities for up to five vessels, security fencing, lighting and 24-hour video surveillance. Funding was provided through the Federal American Recovery and Reinvestment Act (ARRA). Services provided to the Department of Conservation and Recreation (DCR), Office of Waterways included hydrographic/topographic survey, conceptual design, permitting, bid and construction phase assistance.

**Gifford Street Public Access Facility Located in New Bedford, MA**

This project is being funded through the MA Office of Fishing and Boating Access and included surveying, engineering, permitting and bid and construction phase services for the reconstruction of the existing boat ramp, installation of new pile-supported floats, revetment repairs, and parking lot and site drainage improvements.

**MA DCR Salisbury Beach State Reservation Pavilion Project, Salisbury, MA**

Responsible for providing coordination and oversight for obtaining local, state, and federal regulatory approvals for the demolition of the existing Pavilion and construction of a new, smaller structure. The project site is located on a barrier beach within a primary coastal dune and also within a "Priority Habitat for Rare Species: and "Estimated Habitat of Rare Wildlife and Vernal Pools: as designated by the MA Natural Heritage Endangered Species Program.

**Border Street Seawall and Walkway Reconstruction Project, Cohasset, MA**

Performed initial feasibility study which identified preferred reconstruction alternative and associate costs. Coordinated and performed final design and permitting for the reconstruction of a new 315 linear foot granite block seawall and pedestrian walkway located along the top of the structure for the Town of Cohasset. The project required extensive coordination with several local boards to ensure that the new structure conforms to the historic ambiance of Cohasset Harbor.

**MA DCR Emergency Dune Restoration at Salisbury Beach State Reservation, Salisbury, MA**

Provided engineering, design, permitting, and construction oversight services for the emergency placement of over 20,000 cubic yards of sand along a 1,000 linear foot stretch of Salisbury Beach in response to severe dune erosion resulting from the April 15-17, 2007 Nor'Easter. The dune restoration provided protection for 16 private homes located along the beach.

**Phase I Statewide Inventory and Assessment of Coastal Infrastructure Study Performed for MA DCR**

This pilot study was conducted to establish standard inspection and assessment procedures and a conditions rating system to be used by DCR for the evaluation of existing coastal infrastructure throughout the Commonwealth. Project also established a working database that can be used as a baseline in managing the future repair and maintenance work of coastal structures. Inspections and condition assessments were performed on structures located at 18 DCR owned and operated facilities. Work included review of existing record plans, permits, licenses, field inspections, photographs, and

documentation of the type and general conditions of structures. Condition assessments were made identifying the degree of deterioration and/or damage observed so they could be categorized based upon a Priority Rating Index system, which identifies and prioritizes the urgency for the implementation of repairs and/or reconstruction. Estimated costs for structures requiring routine/minor repairs through emergency action were also provided.

**Town Pier Wave Fence Repair Project location in Plymouth Harbor, Plymouth, MA**

Work efforts included the development of construction plans technical specifications, and cost estimate for repairs to the damaged timber wave fence that extends along the perimeter of Town Pier. Project included the removal and replacement of rotted/damaged creosote timber wave fence boards and wales, replacement of missing/corroded hardware, and replacement of deteriorated access ladders.

**Musquashicut Pond Stone Barrier Nourishment Project, Scituate, MA**

Project consisted of renourishing approximately 300 linear feet (LF) of the existing 2,000 LF cobblestone barrier which separates the Atlantic Ocean from Musquashicut Pond, a salt water pond which has been designated by MACZM as a Priority Site under the Wetland Restoration Program. Work was performed for the Town of Scituate Department of Public Works and included surveying, engineering, permitting, and construction oversight for the placement of approximately 1,000 tons of cobblestone.

**Rebecca Road, 4<sup>th</sup> Cliff, Minot Beach, Glades Road, Musquashicut Pond and Surfside Road Foreshore Protection Structures Project for the Town of Scituate, MA**

Provided engineering, permitting, and construction services for the Town of Scituate Department of Public Works for the repair and reconstruction of existing concrete seawalls and stone revetments located at 6 sites. The existing shoreline protection structures at these sites suffered significant damage from a severe Nor'Easter in May 2005. Assisted the Town in securing over \$380,000 in state grant assistance and provided grant administration services throughout the duration of the project.

**Foster Ave.-Ocean Street Revetment Reconstruction Project, Marshfield, MA**

Provided engineering, permitting, and construction services for the reconstruction/repairs to approximately 1,116 linear feet of revetment, reconstruction of concrete access ramp, and repairs to existing stairway for the Town of Marshfield Department of Public Works.

**Glades Road and 3<sup>rd</sup> Cliff Foreshore Protection Structure Project for the Town of Scituate, MA**

Provided engineering, permitting, and construction services for the reconstruction and repairs to over 1,400 linear feet of seawall and revetment along Glades Road and over 700 linear feet of stone revetment at 3<sup>rd</sup> Cliff for the Town of Scituate Department of Public Works.

**Wollaston Beach Improvement Project, Quincy, MA**

Provided sub-consultant services for seawall repairs and beach nourishment phases of the MA DCR project. The project involved the repair of approximately 5,500 feet of concrete seawalls and the placement of beach nourishment along approximately 2,000 feet of the shoreline to restore the recreational beach. Beach nourishment design was developed to minimize and avoid impacts to inter-tidal areas and adjacent mooring basins.



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**SCOTT R. SKUNCIK**

**Project Engineer**

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**CERTIFICATIONS:**

Registered Professional Engineer,  
State of Massachusetts, License #50229

Transportation Workers Identification Card (TWIC)  
Health and Safety Training, including: First Aid,  
Bloodborne Pathogens, CPR, OSHA Confined  
Space, OSHA HAZWOPER, Oxygen First Aid

**EDUCATION:**

University of Rhode Island  
B.S., Civil and Environmental Engineering

**RESPONSIBILITIES:**

Mr. Skuncik has experience in civil and environmental projects. As a Project Engineer with **CLE Engineering, Inc.**, he is engaged in primarily waterfront and marine projects for private, commercial, and public concerns.

**PROFESSIONAL EXPERIENCE:**

**Construction Administration**

***Fairhaven Shipyard – Fairhaven, MA:*** Mr. Skuncik served as Resident Engineer for the driving of steel pipe piles during the construction of a 400-600 ton travel lift. Responsibilities included contractor oversight, ensuring contractor's adherence to stringent driving criteria and specifications as well as troubleshooting of driving issues.

***ExxonMobil – East Providence Terminal:*** Mr. Skuncik served for eight months as Resident Engineer for an oil terminal rehabilitation in East Providence, RI. Mr. Skuncik inspected steel bulkhead corrosion issues through closed circuit camera, collected UTM readings on structural elements, reviewed change orders and submittals, troubleshoot design problems, performed oversight on steel pile installation and modification, represented the client in budget meetings, and reported findings directly to the client.

***Pleasant Street Commercial Wharf – Hyannis, MA:*** Mr. Skuncik served as Resident Engineer for the construction of a new pile supported timber wharf in Hyannis, MA. He served as the owner's representative in dealing with contractor claims related to pile driving, material substitutions, weather and vessel delays, etc.

***Irish Rail Shore Protection – Graystones, Ireland:*** Mr. Skuncik served as Resident Engineer for a three-mile stone revetment in Greystones, Ireland for the Chief Engineer of Irish Rail. Duties included: ensuring compliance with design specifications, inspecting material personally in source countries, conducting weekly project meetings, and evaluating the contractor's claims/invoices.

***Webber Tanks Terminal – Bucksport, ME:*** Mr. Skuncik served as the owner's representative and Resident Engineer for emergency repairs to an oil terminal in Bucksport, ME. Mr. Skuncik oversaw installation and all proof and performance testing of steel pipe piles with rock anchors and rock sockets and evaluated contractor change order requests.

***Beazer Chemical Remediation:*** Mr. Skuncik served for a year during the construction of a 900-foot steel and concrete wharf as Resident Engineer. Duties included: ensuring construction/materials met design specifications, evaluating submittals/RFI's, observing installation of a steel combination wall, inspecting underwater welds using closed circuit camera, writing daily field reports, and meeting with the contractor. Total project cost: \$48 million.





February 25, 2014

Mr. Chris Miller  
Director, Department of Natural Resources  
Town Hall  
2198 Main Street

Re: Cost estimate for monitoring of beaches and habitat for Town of Brewster proposal  
"Building Coastal Resilience in Brewster", RFR ENV 14 CZM 06

Dear Mr. Miller:

At your request, the Association to Preserve Cape Cod is pleased to provide this cost estimate for monitoring services for the above-named proposal.

Proposed services include monitoring of beaches, coastal erosion and habitat at up to ten (10) town beaches where restoration is proposed or planned.

Proposed work: Our proposed beach and habitat monitoring program will provide photographic documentation (photodocumentation) of beaches and coastal erosion at up to ten (10) town-owned beaches and landings. Habitat will be monitored using the natural communities approach developed by the Massachusetts Natural Heritage and Endangered Species Program.

Task 1. Photodocumentation of beaches. APCC will provide systematic photodocumentation using digital photography of beaches and town landings from various points and perspectives. Photographs will be geo-referenced using APCC's GPS equipment and digital cameras and will include reference markers (e.g., landmarks, numbered utility poles, benchmarks if available) and height references (e.g., measuring rod of known length) to enable use of photographs for quantitative estimation of erosion rates. Photodocumentation will be done three times: late summer 2014, winter 2014, and spring 2015. To the extent feasible, the goal will be to document conditions before and after major storm events. Results (photos and a draft and final report, attendance at two meetings), will be provided to Brewster's Natural Resources Director. Information and lessons learned will be shared with the public through a workshop, a page on our website at [www.apcc.org](http://www.apcc.org) and other venues as opportunities arise.

Task 2. Monitoring habitat using the natural community system. Natural communities are defined by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) as "assemblages of species that occur together in space and time. These groups of plants and animals are found in recurring patterns that can be classified and described by their dominant physical and biological features" (<http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/natural-communities/>). Examples of some natural communities found in coastal

dunes, beaches and tidal flats include Maritime Beach Strand, Maritime Dune, Maritime Pitch Pine on Dunes, Saline/Brackish Tidal Flats, and Coastal Salt Pond Marsh. APCC has mapped natural communities on Cape Cod for two summers. We propose to conduct rapid-reconnaissance surveys to identify types of natural communities present at the proposed sites, using MNHESP's Field Form 1 (attached).

**Estimated labor, Tasks 2 and 3: 100 hours @ \$58.33 per hour = 5,833.00**

Note: APCC will match this proposal with \$5,000 for coastal erosion monitoring and \$5,000 for monitoring Freeman's Pond salt marsh, through a grant from the Eddy Foundation of Brewster. The grant will be used to cover labor and direct costs (e.g., mileage, materials and supplies, communication, copies, etc.).

Thank you for contacting APCC to request a cost estimate. We look forward to working with the Town on this important and timely project.

Sincerely,



Ed DeWitt  
Executive Director

Attachment: NHESP Natural community field form 1

ED/jm

## **Jo Ann Muramoto, Ph.D.**

### **EDUCATION**

Ph.D., Geological Sciences, 1992, Cornell University, Ithaca, NY (minors in Microbiology, Environmental Quality). Ph.D. Thesis Title: “Studies of Sulfur Biogeochemistry, Microbiology and Paleontology in Three Anoxic Environments: The Black Sea, A Salt Marsh Mat, and an Ordovician Black Shale”.

B.S., Biology, 1977, California Institute of Technology, Pasadena, CA

### **PROFESSIONAL EXPERIENCE**

Senior Scientist, Association to Preserve Cape Cod (APCC) and Massachusetts Bays Program (MBP) Regional Coordinator for Cape Cod, July 2006 – present. Works with Cape Cod communities to preserve and restore coastal ecosystems and implement the Comprehensive Conservation Management Plan for Cape Cod and Massachusetts Bays. Goals include restoration of coastal habitat, improving water quality and building local capacity. Responsibilities include providing technical assistance (e.g., project management, coordination, grant-writing), monitoring restoration sites, providing outreach and presentations, and assisting the Barnstable County Coastal Resources Committee, the County’s coastal advisory committee and local governance committee for the MBP Cape Cod region.

Senior Project Manager and Coastal and Wetlands Division Director, Horsley Witten Group, 1999 – July 2006. Senior project manager at an environmental firm, specializing in coastal and ocean issues, drinking water protection, water and sediment chemistry, risk assessment, statistical analysis, environmental assessment, permitting, and information transfer, and QA/QC. Responsibilities included project management, proposal writing, corporate QA/QC, technical writing, and staff supervision.

Conservation Administrator, Town of Falmouth, MA, 1995 – 1999. Administered state and local wetland regulations, reviewed permit applications, wrote wetland permits, advised Conservation Commission, applicants and the public concerning wetland regulations, provided litigation support, conducted enforcement, prepared land management plans, and supervised the Conservation department.

Senior Biogeochemist, ENSR Marine Sciences, 89 Water Street, Woods Hole, MA 1995. Conducted monitoring of sediment and water quality at ocean disposal sites (e.g., Boston Harbor sewage outfall in Massachusetts Bay), evaluated data, and prepared reports and proposals.

Biogeochemist, Science Applications International Corporation (SAIC), 89 Water Street, Woods Hole, MA, 1990 - 1994. Monitored sediment and water quality at ocean disposal sites in New York Bight and the Farallon Islands Navy Disposal Site, participated in oceanographic cruises, performed statistical analyses, assisted with R&D of instrumentation for monitoring polycyclic aromatic hydrocarbons, and prepared reports, permit applications and proposals.

Postdoctoral Investigator, Geology and Geophysics Department, Woods Hole Oceanographic Institution, 1992 - 1993. Conducted research in Black Sea sulfur biogeochemistry, participated in oceanographic cruises, and prepared reports, literature reviews, scientific articles and proposals.

Graduate Research Assistant and Teaching Assistant, Cornell University, Geology Department, 1982 - 1990. Conducted doctoral research in sulfur biogeochemistry and microbiology in the Black Sea, wrote proposals and scientific papers, and taught Historical Geology. Guest Student at the Woods Hole Oceanographic Institution, Geology and Geophysics Department.

Mineralogy Consultant, Jet Propulsion Laboratory, California Institute of Technology, 1982. Analyzed meteorites using electron microscopy and microprobe to help determine their origin and age.

Post-graduate student, University of Southern California, 1981-1982. Attended post-graduate courses in trace fossils, mineralogy, and paleontology.

Graduate Research Assistant, Zoology Department, Australian National University, Canberra, Australia, 1979 - 1980. Conducted research in biogeographic variation of lizards (Scincidae) in New South Wales, Australia, involving field trapping and studies of morphology and animal behavior.

Research Assistant, Geology Department, California Institute of Technology, 1977 - 1978. Analyzed biomineralization in marine organisms using SEM, x-ray diffraction, and spectrophotometry.

## **REPRESENTATIVE WORK IN PAST 10 YEARS**

Restoration of Stony Brook Salt Marsh, Freeman's Pond Salt Marsh and Lower Mill Pond Fish Passage, Brewster, 2006 to 2013. Assisted Town of Brewster with project development, project management, grant-writing, and monitoring to restore 41 acres of salt marsh and fish passage to 386 acres of spawning area. Monitoring includes tidal studies, herring counts, and monitoring of water level, Phragmites, rare species and salt marsh. Restoration of Stony Brook occurred in November 2010; restoration of fish passage to Lower Mill Pond occurred in Fall 2012; and restoration of Freeman's Pond was completed in Fall 2013. Total grants from agencies: \$1,647,900 from NOAA and the American Recovery and Reinvestment Act of 2009 and \$58,600 from the Gulf of Maine Council and NOAA.

Technical assistance to Cape Cod municipalities and organizations, 2006 – ongoing. Provided direct grant-writing assistance to towns and organizations to obtain \$2.2 million in grants for coastal restoration, stormwater, pumpouts, outreach, climate change adaptation, and applied research, and helped to obtain an additional \$7.6 million in grants by providing other support. Assisted with project development and project management. Clients included towns (Brewster, Sandwich, Dennis, Yarmouth, Provincetown, Orleans, Wellfleet, and Falmouth), and organizations (Provincetown Center for Coastal Studies, Friends of Herring River, Wellfleet Audubon Sanctuary, and Cape Cod Commercial Hook Fishermen's Association).

Evaluating Impacts of Sea Level Rise on a Coastal Aquifer, 2012 – ongoing. In this climate change adaptation project, the U.S. Geological Survey will model the response of the mid-Cape's groundwater system to sea level rise in order to predict impacts of sea level rise on the elevation of the water table, changes in stream hydrology and baseflow, and the position of the saltwater-freshwater interface below Cape Cod. APCC and the Cape Cod Commission will develop outreach and policy tools based on the USGS model and findings. The project will provide science-based risk information on the effects of sea level rise on the Cape's groundwater system to inform public water suppliers, wastewater and

stormwater managers, natural resource managers, and community planners. Project responsibilities include science translation into outreach materials, grant-writing and project management.

Review of Pilgrim Nuclear Power Plant impacts on Cape Cod, 2013. At the request of the APCC Board of Directors, the environmental impacts of Pilgrim were reviewed to identify potential risks to Cape Cod's environment. The findings were used to prepare a position statement for the Board.

Restoration of Fish Passage to Upper Shawme Lake, Sandwich, 2008 to 2013. Assisted the Town of Sandwich Natural Resources Department with grant-writing, grant management, and monitoring of a new fish ladder to Upper Shawme Lake which will restore anadromous fish passage to a 20-acre pond. Helped the Town to obtain \$78,000+ in grants to replace the fish ladder. Ongoing activities include coordinating a volunteer herring count program to document the return of herring following restoration.

Barnstable County Coastal Resources Committee (CRC), 2007 – ongoing. Helped re-establish the CRC as a coastal advisory committee to the County and towns and as the local governance committee for the Mass Bays Program. The CRC is the liaison between the County and the 15 towns on Cape Cod on coastal issues. Members include representatives from all 15 towns on Cape Cod, and regional, state and federal agencies. Responsibilities include staffing and coordination. CRC activities include recommendation of projects for the NRCS Cape Cod Water Resources Restoration Project, and outreach workshops (e.g., role of shellfish in nitrogen uptake, stormwater utilities).

Mayo Creek Salt Marsh Restoration Feasibility Study, Wellfleet, 2009 – 2010. Assisted the Town of Wellfleet Conservation Department with grant-writing, grant management, project management and monitoring for a salt marsh restoration feasibility study to restore 25 acres of impaired salt marsh.

No Discharge Area designations for Cape Cod Bay, Nantucket Sound and Vineyard Sounds, 2006 – 2011. Assisted CZM in designating these waters as federal No Discharge Areas (NDAs) for boat sewage. Responsibilities included preparing an NDA application and outreach materials, collecting data, and grant-writing. Obtained a \$10,000 Action Grant from the Gulf of Maine Council for outreach.

Stormwater Utility Outreach Program For Cape Cod Municipalities, July 2006 – ongoing. Provided Cape Cod communities with outreach on financing options for stormwater management, including stormwater utilities. Outreach included workshops, meetings, outreach materials, articles and website. Work resulted in one town conducting a pre-feasibility study for stormwater utilities, and generated interest in the Buzzards Bay watershed. Award amount: \$40,000.

Assessment of Stormwater Drainage and Stormwater Pollutants in Paines Creek and Stony Brook Watershed, Brewster, MA, 2007. Helped the Town of Brewster DPW to prepare a proposal to the MA CZM Nonpoint Source Program to evaluate stormwater discharges into the Stony Brook watershed. This assessment supported four subsequent remediation projects, and serves as a model for a watershed approach to stormwater management. Award amount: \$19,150.

Citizen Monitoring of Fish Runs, 2006 to present. This program builds citizen support for restoration of fish runs by engaging volunteers in monitoring fish runs. Data are used by state and federal fisheries managers for fisheries management. Helped set up volunteer count programs in nine towns and 12 runs. Responsibilities include coordination of volunteers, data management, reporting, and outreach.



Technical Writer/Editor, EPA Water Security Training Tools, U.S. EPA Office of Ground Water and Drinking Water, 2002 - 2006. Wrote and edited water security guidance documents, technical reports, and fact sheets for water and wastewater suppliers (e.g., *Handbook of Water Security, Response Protocol Toolbox for Water Contamination Threats and Incidents*, others). Contract value: \$350,000.

Assessment of Relative Risks of Wastewater Management Options for South Florida, U.S. EPA, Office of Ground Water and Drinking Water, 1999 - 2003. Helped manage a study, mandated by Congress in 2000, to evaluate the human health and ecological risks of disposal of treated wastewater in South Florida via ocean outfalls, Class I deep injection wells, surface water discharge, and aquifer recharge. Responsibilities included project management, designing a relative risk methodology, collecting data, reviewing literature, conducting the risk assessment, preparing reports and presentations, and providing quality assurance. Contract value: \$600,000.

## **ORGANIZATIONS, COMMITTEES**

Mass Bays Program, Science and Technical Advisory Subcommittee, 2013  
Sigma Xi Scientific Society, member  
Association to Preserve Cape Cod, member (former member, Board of Directors, 1995-1996)  
Barnstable County Coastal Resources Committee, staff member, 2006 - ongoing  
Steering Committee, River Herring Warden Network, 2010 - ongoing  
The 300 Committee Land Trust, Board of Directors, 2000 - ongoing  
Falmouth Coastal Resources Working Group, 2000 – 2010.  
Waquoit Bay National Estuarine Research Reserve Advisory Committee, 2011

## **AWARDS AND HONORS**

Coastal America Partnership Award, Stony Brook Project Team, 2011  
British Petroleum Postdoctoral Investigator Award, 1992  
National Science Foundation Dissertations Symposium in Chemical Oceanography, 1991  
American Association of Petroleum Geologists Research Grant Award, 1986  
Geological Society of America Research Grant Award, 1985  
Commonwealth Scholarship, Australian National University, Canberra, Australia, 1979  
California State Scholarship, 1973

## **SELECTED PUBLICATIONS**

Association to Preserve Cape Cod. 2013, 2012, 2011 and 2010. Annual Monitoring Reports for the Stony Brook Salt Marsh and Fish Passage Restoration Project. These reports provide pre- and post-monitoring data on herring counts, salt marsh vegetation, water quality, flow parameters, *Phragmites* coverage, and rare plant species. Provided to the Town of Brewster under a NOAA grant from the American Recovery and Reinvestment Act of 2009.

Association to Preserve Cape Cod. 2009. Frequently Asked Questions, Stormwater Utilities.

Horsley Witten Group. 2004. Towards an Ocean Vision for the Nantucket Shelf Region: Part I. Evaluation of Natural Resources of the Nantucket Shelf Region. Part II Recommendations for Protection and Sustainable Uses. Prepared for the Center for Coastal Studies, Provincetown, MA.

Horsley Witten Group. 2004. Guidebook to the Response Protocol Toolbox: Responding to Drinking Water Contamination Threats and Incidents. Prepared for the U.S. EPA Water Security Task Force.

U.S. Environmental Protection Agency. 2003. Relative Risk Assessment of Wastewater Management Options for South Florida. Report prepared for U.S. EPA, Office of Ground Water and Drinking Water, available at <http://www.epa.gov/region04/water/uic/proposedrule.htm>.

Urban Harbors Institute, U.S. EPA Office of Water, Oceans and Wetlands, and Horsley & Witten Group. 1999 – 2003. *Coastlines* Newsletter. Editor for *Coastlines*, the newsletter of the National Estuary Program (NEP).

Muramoto, J. 1995. Analysis of Bulk Sediment and Tissue Samples Collected During the April 1994 Post-Cap Survey of the Dioxin Capping Monitoring Program at the New York Bight Mud Dump Site. Prepared for the U.S. Army Corps of Engineers, Waterways Experimental Station, Vicksburg, MS.

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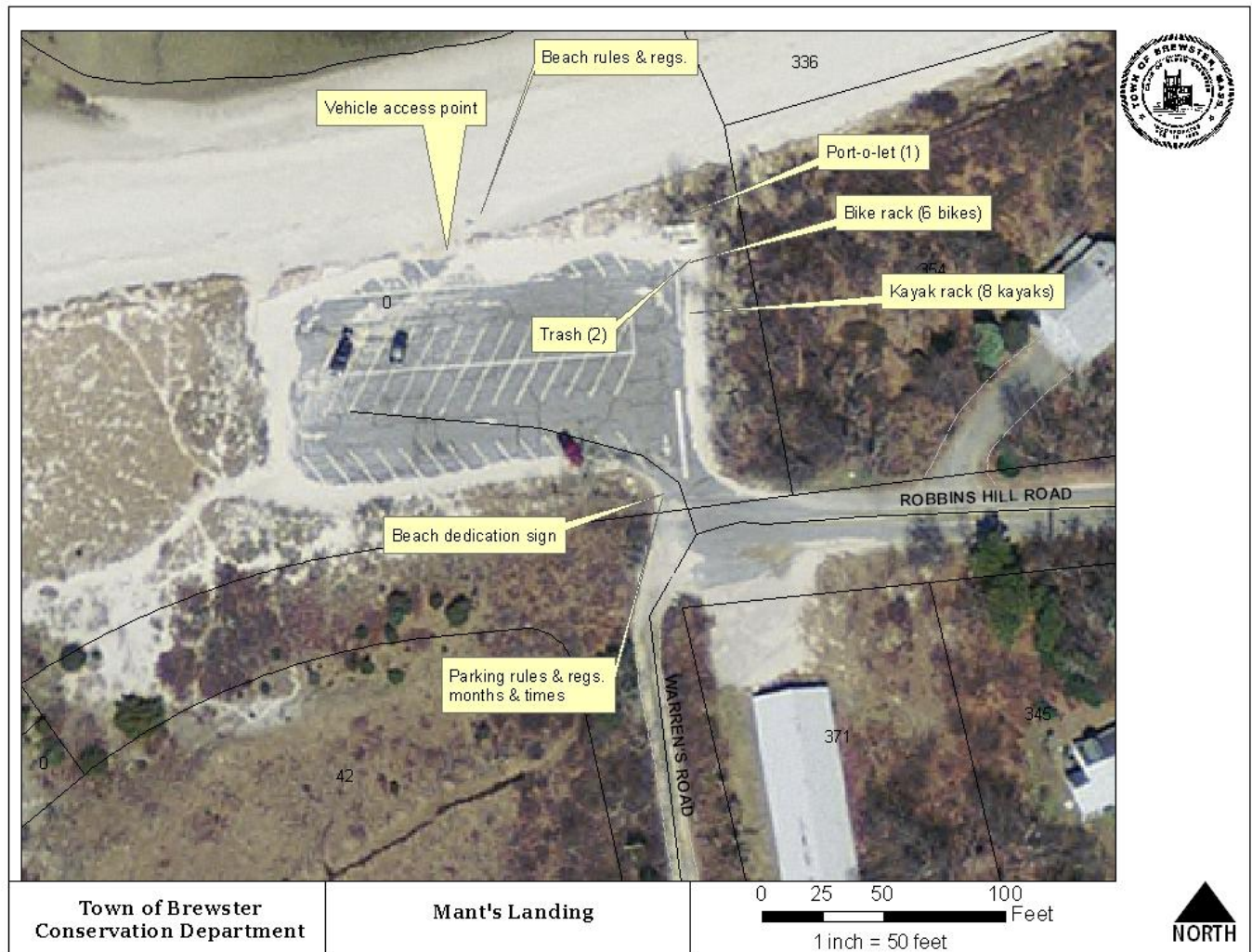
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## Mants Landing



**Location:** End of Robbins Hill Road, Map 2, Lot 1

**Parking:** 44 spaces including two handicap spaces. Permit required June 15 to Labor Day, 9am to 3pm.

**Amenities:** One port-o-let and two trash containers, bike rack, kayak rack. Memorial Day to Labor Day (inclusive). Access point for aquaculture, emergency access for boats and vehicles.

**Erosion:** -1.97 to -2.1 feet per year lost.

**Features:** Popular beach in summer; adjoins Paines Creek to the west. Anchorage located on flats to west of parking lot. Town shellfish grant plus three private grants on flats due north of parking area.

Parking lot is situated at the end of Robbins Hill Road at a low point adjacent to the beach. The parking area is protected by a minimal dune supported in part by split rail fencing at the parking lot's northern edge with some buried boulders. Further west is a dune area fronted by a sandy beach and remnant salt marsh.

### Storm Damage:

Protective dunes at north edge of parking lot are gone, along with regulatory sign, split rail fencing, beach grass and other plantings. North edge of pavement broken, undermined and lifted; will need to be removed and repaving of north end of lot.





Facing west at the northern border of the Mants Landing parking area.



Facing east at the northern border of the Mants Landing parking area.



Photo during storm, taken from Robbins Hill Road, outside of landing looking northwest. Note waves within parking area and water running down street to south.





View looking east at entrance to beach. Dune, beach sign and fencing is gone, asphalt lifted or missing.



View looking west from entrance to beach. Dune and fencing is gone, asphalt lifted and broken.





Looking northwest, showing extent of damage pavement, sand in parking area, missing dunes and fencing.

## **Adaptive management of Mants Landing Beach parking area.**

Mants Landing is a town-owned approximately 11 acre beach and dune area with a paved 42-space parking area and approximately 1,500-foot public beach located on Cape Cod Bay. This is also an important access point to the Brewster Flats for vehicles providing emergency response, and for the public who utilize it for over sand transport of machinery and sand for nourishment projects on private properties within about a 1 mile radius. It also provides essential access to three private oyster aquaculture grants plus the Town's aquaculture propagation area. This is also one of the public boat mooring areas on the bay, and providing access and parking is essential for boaters. In addition, this is the access point for a proposed oyster reef pilot project designed to establish a reef to protect and enhance fringe salt marsh and dune fronting Brewster's only salt pond.

The paved parking area at Mants Landing Beach suffers from repetitive storm damage (see attached photographs). Protective vegetative dunes at the north side of the parking lot have been repeatedly destroyed, and the parking lot is regularly inundated on storm events greater than the 10-year storm. This inundation has caused extensive damage to the pavement, requiring expensive and short lived repairs.

The objective is to remove fill material and asphalt pavement from within a dune, with replacement by a resilient material that would also minimize the generation of stormwater. This project would test the use of a removable permeable flexible articulating concrete mat (ACM) as an interim replacement for a paved parking area on a beach until a permanent solution can be found. The design would also allow a measured retreat by allowing segments of the mat to be removed as erosion affects the area fronting the beach. It would also minimize the ongoing environmental affects a failing asphalt and fill parking area have on the surrounding habitat.

If the mat is successful (as measured by public acceptance, reduced need for repairing the parking area after each storm and improved beach and dune habitat as demonstrated by monitoring, it will be utilized at other vulnerable Town beach parking areas until more permanent solutions are identified. Such flexible concrete mats have been utilized elsewhere on Cape Cod with success as boat ramps and to improve small parking areas.

The existing pavement and underlying fill would be excavated and removed. Clean sand fill compatible with the surround dune deposits would be brought in and the lot and entrance at the road would be regraded to minimize the effect of inundation and flooding to the roadway to the south. The ACMs would be underlain by a geogrid, filter fabric, and a layer of stone. At the end of the lot near the beach, the ACMs would be embedded into the beach for added resilience.

A short seasonal boardwalk would be placed directly adjacent to the entrance to the beach for foot traffic and to provide handicap access to the beach area.

The area of pavement at Mants Landing is approximately 20,000 square feet. All pavement and underlying fill would be excavated and removed to expose native materials. The grade in the parking area would then be adjusted, with a lower grade near the beach at the north, and raised grade to the south. This would be more in keeping with the surrounding properties, and would lessen storm damage to roads and houses further inland (see photographs following; winter storms often inundate the parking area and flow to the south down the paved roadway).

The area previously paved, including a section of the access road into the lot and a short access out to the beach, would be replaced with ACM (ArmorFlex or equivalent). CLE Engineering has provided the attached cost estimate for design, permitting and bidding.

February 19, 2014

Mr. Chris Miller  
Director, Natural Resource Department  
Town of Brewster  
2198 Main Street  
Brewster, MA 02631

Via E-mail

**RE:** Coastal Community Resilience Grant Budget

Dear Mr. Miller,

CLE Engineering, Inc. (CLE) is pleased to provide the following response to your request for budget values for use in your submittal of the Town of Brewster's application for the Coastal Community Research Grant. CLE has provided budget estimates for each of the Tasks as requested in your e-mail dated February 11, 2014. I have broken the requested Tasks into two separate projects and retained the references (in parentheses) you used for each task in the e-mail.

Project 1 (2a): Mants Landing – Design, Permitting and Preparation of Bid Documents

Task 1: Design: \$12,100

Task 2: Environmental Permitting: \$12,500

Task 3: Final Design and Specifications: \$10,400

**Total: \$35,000**

Assumptions:

1. A topographic survey will be performed using a Real Time Kinematic (RTK) Global Positioning System (GPS) with a stated horizontal and vertical accuracy of 2.5 cm.
2. The design will **not** include a boat ramp.
3. The design will include Articulating Concrete Mats and a boardwalk.
4. Soil samples will be obtained for grain size analysis for use in geotechnical analysis.
5. A site plan of the design will be prepared and presented at a public meeting in Brewster prior to preparation and submittal of permit applications.
6. The plans and applications will be prepared and submitted for the following permits:
  - a. MEPA ENF and Scoping Session for alteration to coastal dune
  - b. DEP Chapter 91 for work below Mean High Water will **not** be required
  - c. Corps of Engineer for work below Annual High Tide Line will **not** be required
  - d. Notice of Intent (assumes 2 hearings)
  - e. Associated expenses such as filing fee to MESA if needed, certified mail and legal ads are included.
7. The Final Construction Plans and Specifications will be prepared upon receipt of all permits and provided to Brewster for their administration of the bid process and contract

award.

8. Construction oversight services are **not** included in the budget.

Project 2 (2b) Engineering Analysis of ten (10) public landings

Task 1 Field Work: \$35,650

Task 2 (2c): Draft Assessment and Planning Recommendations with Incorporation of Town's Comments as Preferred Option: \$25,500

Task 3 (2d): Three (3) Public Meetings and One (1) Meeting with the Provincetown Center for Coastal Studies: \$5,000

Task 4 (2e): Preparation of Monitoring Schedule/Scope of Work: \$7,150

Task 5 (2f): Preparation of Notice of Intent for Each of Seven (7) Sites based on Preferred Option for Ongoing Maintenance and Nourishment: \$11,900

Task 6 (2g): Preparation of Final Beach and Landing Atlas

With Recommendations: \$10,850

**Total: \$96,050**

Assumptions:

1. It is assumed the field work including the topographic survey and existing conditions site plan from Project 1 above will be used for the analysis of Mants Landing. Additional field topographic survey work will be performed on the remaining nine (9) sites with the exception of Mants Landing.
2. A topographic survey will be performed at the nine (9) sites using a Real Time Kinematic (RTK) Global Positioning System (GPS) with a stated horizontal and vertical accuracy of 2.5 cm. It is assumed the average length of beach frontage at the existing structures is 250' and beach transects will be surveyed on 25' centers.
3. Wetland resources will be delineated on each of the seven (7) sites; it is assumed the wetland resources will have been delineated for the NOI on Ellis Landing and Breakwater Beach prepared by others and will be provided.
4. Soil samples will be obtained from each of the seven (7) sites for grain size analysis for use in geotechnical analysis. It is assumed the grain size analysis from Ellis Landing and Breakwater Beach will be provided by others.
5. A Benchmark (BM) will be set to provide vertical control on each of the seven (7) sites; it is assumed the BM from Ellis Landing and Breakwater Beach established by others will be provided.
6. A review of available resource reports/assessments will be made. It is assumed the Town will provide its available reports and other sources such as MassGIS, DMF, DEP, etc. will be reviewed.
7. No field work consisting of shellfish surveys, habitat identification, fisheries or other resource identification/delineation is anticipated in this budget.
8. The location and condition of the existing infrastructure at each of the ten (10) sites will

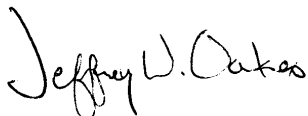
be documented.

9. A site plan of the existing conditions will be prepared for each of the ten (10) sites
10. A review of available existing conditions reports for the ten (10) sites will be made to determine rates of erosion/accretion, frequency and nature of repairs, typical residential usage types, etc.
11. Recommended actions intended to provide coastal resiliency for each of the ten (10) sites will be developed for the 5 year, 10 year and 30 year time frames.
12. A brief PowerPoint presentation on all ten (10) sites describing the above recommendations will be prepared and presented at three (3) public meetings in Brewster.
13. A list of quantifiable features at each of the ten (10) sites will be prepared and reviewed with the Town for development of a Monitoring Plan.
14. A Monitoring Scope of Work will be prepared describing the features to be measured, the methodology to be used and the frequency of the measurements.
15. It is assumed the Town will be responsible for execution of the Monitoring Plan at all ten (10) sites.
16. Seven (7) Notice of Intent (NOI) filings will be prepared for the seven (7) sites for the ongoing maintenance and nourishment work to be done in accordance with the planning recommendations described above (Task 11).
17. It is assumed the seven (7) NOI filings will be presented to the Conservation Commission at two (2) public hearings.
  - a. Associated expenses such as filing fee to MESA if needed, certified mail and legal ads are included.
18. A Final Beach and Landing Atlas will be prepared for each of the ten (10) sites. It will contain a description of existing conditions, site plans, Monitoring Plan, recommendations for the 5 year, 10 year and 15 year time frames and all permits.

I trust you will find this budget breakdown of the costs to provide the services described in your February 11, 2014 e-mail useful in the preparation of your Grant request.

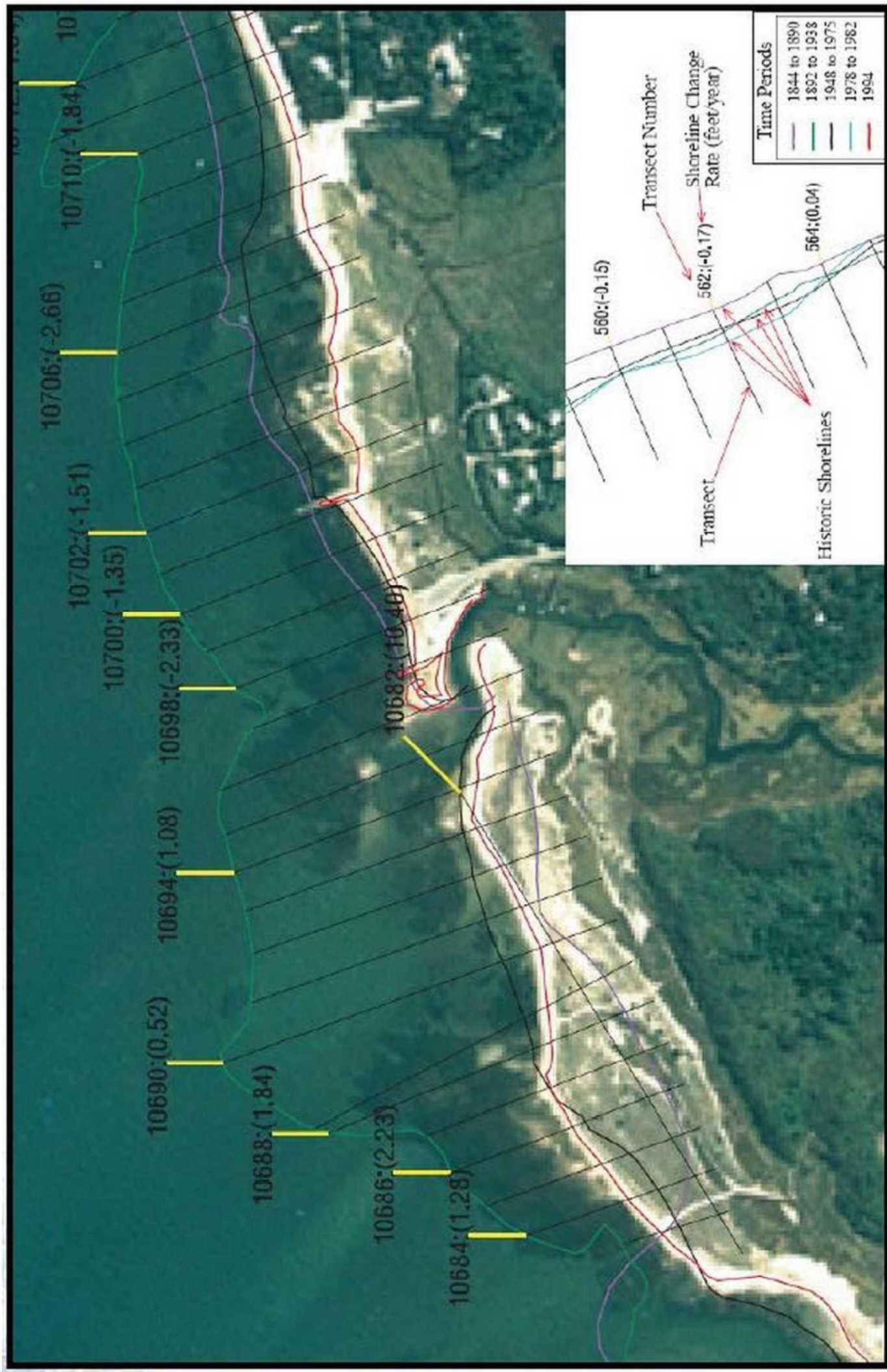
Please contact me with any questions.

Very Truly Yours,  
CLE Engineering, Inc.



Jeffrey W. Oakes, P.E.  
Senior Project Manager





**Figure 17. Rates of historic shoreline change between 1847 and 1994 as determined by Thieler et al. (2001).**





**Figure 18. Aerial showing NHESP priority habitat for state-protected rare species (Mass GIS).**

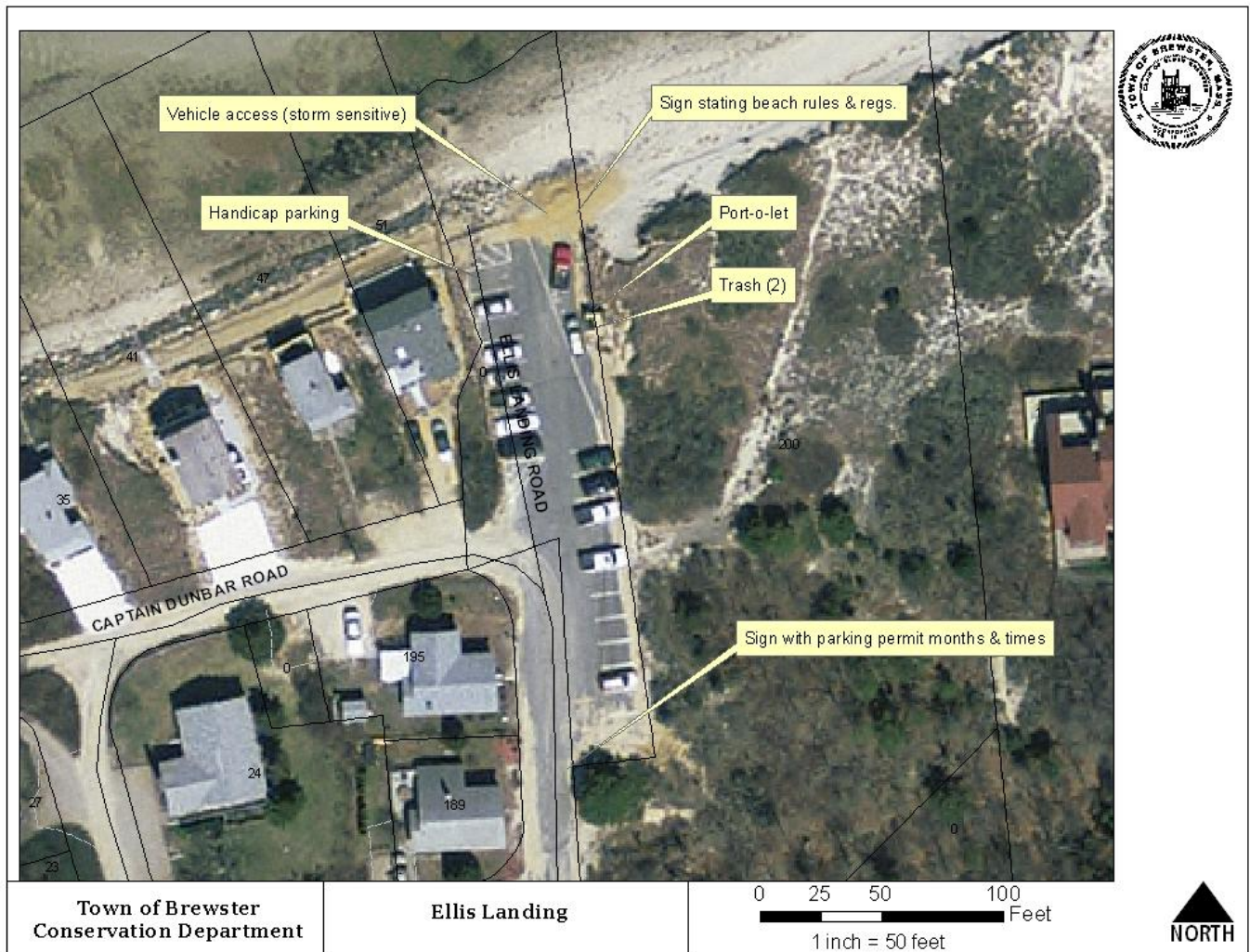








## Ellis Landing



**Location:** At the end of Ellis Landing Road. Map 7, lot 16.1

**Parking:** 19 spaces including one handicap spaces. Permit required June 15 to Labor Day, 9am to 3pm.

**Amenities:** One port-o-let and two trash containers, Memorial Day to Labor Day (inclusive). Coastal access point for aquaculture, emergency beach access for boats and vehicles.

**Erosion:** -0.66 feet per year lost.

**Features:** Popular beach in summer. Town and private aquaculture areas use this landing for access to the beach. Location of spring/fall littleneck shellfishing and fall oyster Sundays program.

Undeveloped property directly adjacent to the east is owned by Brewster Conservation Trust, and provides additional beach area for residents.

The properties to the west are protected on their northern edge by a limited stone revetment. The revetment extended partially onto the town landing property.

## Storm Damage

Extensive erosion at north end of lot. Loss of about 20' of pavement, split rail fence, regulatory signs. Needs extensive nourishment to rebuild dune and provide vehicle access ramp to beach.



Photo during storm.



After storm. Extensive erosion at north end of landing. Dune and north end of pavement is gone.





Photo at north end of landing looking west. Parking area and dune had extended to end of stone revetment to west.



Photo looking south at landing from beach showing extensive erosion and loss of pavement.



Photo from north end of landing looking east.





Ellis Landing in October 2006. Stormwater infiltration structure is functional.



**Planning and design for managed retreat at Ellis Landing:** This task involves planning and design for resilient infrastructure at Ellis Landing. The objective is to plan for managed retreat, provide sustainable public access that minimizes or avoids impacts on habitat, and reduce the risk of damage and need for continued public investment.

Ellis Landing is a key access point for the Town's shellfish programs, as well as for private aquaculture grants located directly north and west from the landing. It also provides essential beach access and serves as one of Brewster's emergency beach access points. The ramp to the beach is on the north eastern portion of the parking area, is constructed of sand, and due to its slope and continued erosion and scour, requires frequent nourishment.

The historic parking area was constructed on coastal dune. It is located at the end of a road leading from Rt 6a to the south, and significant stormwater flows down to the end of the road, along with significant stormwater from two private roads just south of the landing. A stormwater catch basin formerly servicing the parking area now sits on the open beach and the partial revetment for the parking area is in disrepair and does not function.

A residential home is located directly to the west, protected at the north by a revetment of loose piled stones. The revetment return extends part way across Ellis Landing. Recent erosion and winter storms have damaged the revetment and a corner of the home's foundation. The parking lot has suffered severe repetitive damage from coastal storms and erosion.

The neighboring property to the east is coastal dune, and is owned by the Brewster Conservation Trust (BCT). The dune at the north portion of the BCT parcel has suffered accelerated erosion due to end scour from the revetment. Continued nourishment by the Town and revetted parcels to the west is needed to minimize damage to this dune.

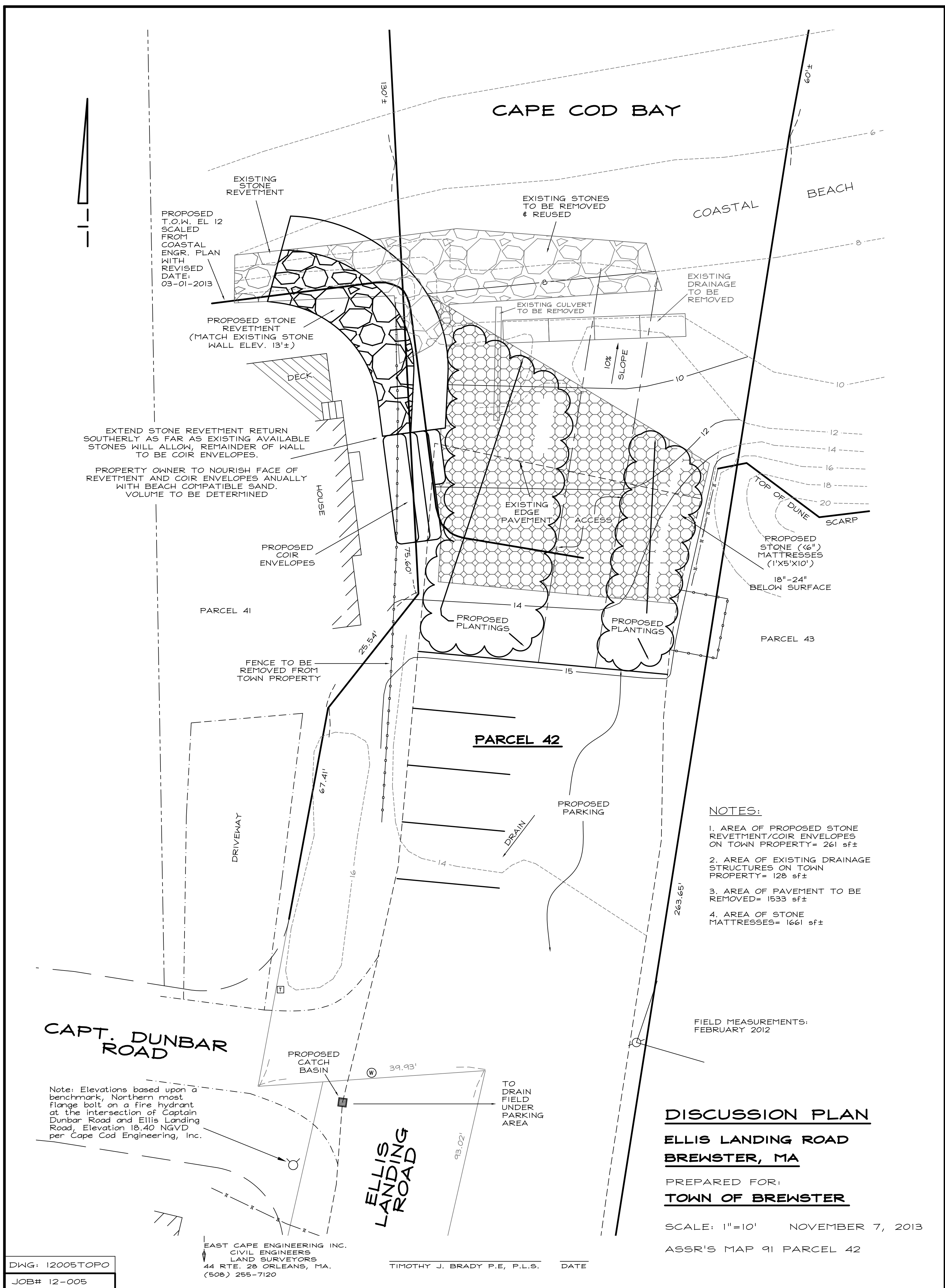
The conceptual design incorporates a return for the neighboring revetment where it meets the coastal dune located to the east of the site. That aspect of the work is located partially on private property and its construction is not being undertaken nor financed by the Town. However, the engineer for the Town has been involved in the design of that portion of the work, which includes a measured retreat and a combined stone and coir protective return from the adjacent revetment, because it is partially located on Town property. The remaining work located entirely on Town property includes a resilient articulating concrete mat (ACM) ramp leading down to the beach. The ACM would be buried beneath screened sand compatible with the beach sediments, and a schedule for nourishment would be included in the permit.

The Town is also completing stormwater work within the landing and the roadway to the south. This is anticipated to be constructed in the fall of 2014. Although not funded, it is on the Town's capital plan and is scheduled for construction in Fall 2014. However, no funds for design, permitting or construction of the stormwater work are included in this grant application. The proposed ramp would allow direct infiltration of stormwater, and the concept also slopes the parking area to keep stormwater further south where it can be collected and treated with infiltration galleries located in the parking area to the south.

**Budget: \$10,000** (East Cape Engineering)

**Match: \$10,000** (Previously budgeted Town funds towards this project)

**Leveraging:** Stormwater work scheduled for Fall 2014 requires a final design for the ramp.





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## Principals



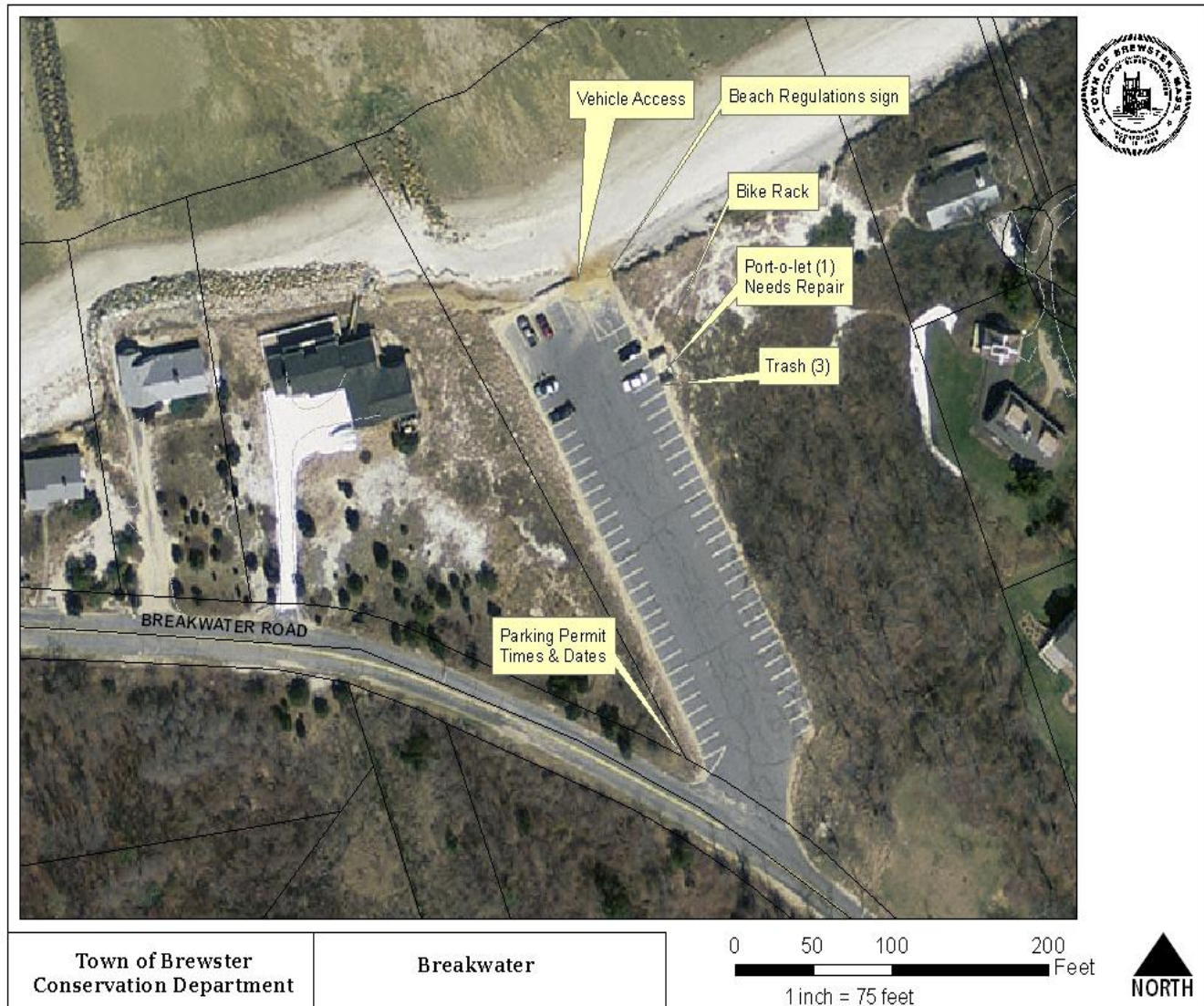
**Timothy J. Brady, P.E., P.L.S.**, is co-owner and President of East Cape Engineering, Inc., and a Cape Cod native. He is a Registered Professional Civil Engineer and Registered Professional Land Surveyor. Tim has a Bachelor of Science degree in Mechanical Engineering from Oklahoma State University. He is a member of the Massachusetts Association of Land Surveyors and Civil Engineers and the American Society of Civil Engineers.

Tim's expertise lies in all areas of land surveying including property line, topographic, data collection, and construction. As a Professional Engineer, he works in residential and commercial site design including septic system design, zoning issues, and wetlands considerations. He has vast knowledge of local, state, and federal regulations and has served as an expert witness in Land Court cases. Recent site design projects include Sally's Way Affordable Housing for the Town of Truro, Our Lady of Lourdes Catholic Church in Wellfleet, the Bell Tower at the Community of Jesus property in Orleans, the Meadow Road Condominiums in Provincetown, and the youth hostel in downtown Hyannis. Tim has completed numerous design projects for homeowners, developers, and contractors throughout the lower Cape.

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## Breakwater Beach Landing



**Location:** On Breakwater Road at the first bend. Map 4 lot 55.

**Parking:** 62 spaces (**winter of 2009/2010 damage likely removed four parking spaces**) including two handicap spaces. Permit required June 15 to Labor Day, 9am to 3pm.

**Amenities:** One port-o-let and two trash containers, one bike rack ( 8 bikes) Memorial Day to Labor Day (inclusive). Coastal access point for aquaculture, emergency beach access for boats and vehicles.

**Erosion:** -0.33 to -0.39 feet per year lost.

**Features:** Popular beach in summer. Large parking area.

The parking area was protected by a dune that was last rebuilt in the spring of 2011 using sturdy fencing and beach grass stems. It was very successful in collecting migrating sand and stabilizing the dune. On the northeast side is an eroding bluff; adjacent to the west is a coir log and dune extending partially onto the town property then leading west to a stone revetment. There is also a groin and the outlet pipe for the Consodine Ditch on the western property boundary.

### Storm Damage

Pavement lost at north end of lot. Protective dune, plantings, coir logs, and sturdy sand fencing need to be replaced, extensive nourishment with beach sand.





Photo during storm; waves impacting parking area. Wire in foreground is from (former) coir logs at north end of parking area.



Post storm parking area looking north.



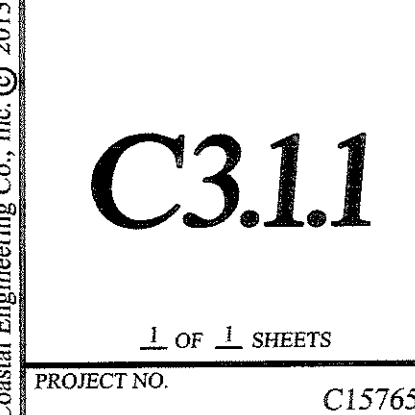
Photo at beach looking east. Extensive erosion to dunes.











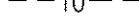




Looking southeast at north end of parking lot. Protective dune, sturdy sand fence, coir logs and beach grass plantings eroded away and north end of pavement is gone.





	BOUND
	GAS METER
	WATER VALVE
	IRRIGATION
	ELECTRIC METER
	MISC. SIGN
	UTILITY POLE
	GUY POLE
	GUY WIRE
	FENCE
	CONTOUR
<b>X 10.09</b>	SPOT GRADE 02/25/13

NOT TO SCALE

## Breakwater Landing Town of Brewster, MA Retrofit Concept

**Objective:** Shoreline erosion has led to loss of dunes and deterioration of the parking lot. In fact, sand deposition has occurred 100 ft into the parking lot. The goal of this retrofit concept is to restore protective dune habitat, provide comparable parking amenities (maintain 59 spaces), improve beach access, and minimize the use and impact of impervious cover.

**Concept:** Breakwater Landing is a town-owned 3.4-acre park, including a 59-space parking area and approximately 300-foot beach located on Cape Cod Bay. This is also an important access point to the Brewster Flats for vehicles providing emergency response, and for the public who utilize it for over sand transport of machinery and sand for nourishment projects on private properties within about a 1 mile radius.



*The parking lot at Breakwater Landing is subject to sand deposition and pavement deterioration due to shoreline erosion and rising sea levels.*

Breakwater Landing has been subject to repetitive severe storm damage (see attached photographs). The Town has regularly reconstructed a sacrificial vegetated dune at the north end of the lot after major storm events, plus a sturdy sand fence to capture additional wind-blown sand. The Town and adjacent property to the west are currently reconfiguring this vegetated dune (spring 2014). See attached plan from Coastal Engineering.

The objective is to remove the infrastructure at risk from coastal storms and ongoing erosion, provide comparable parking, restore an extensive protective and resilient dune habitat behind the beach, improve beach access, minimize impervious cover, and install green stormwater infrastructure (e.g., vegetated bioretention swales) to improve water quality for swimming, shellfishing and habitat. Outputs include removal and relocation of the asphalt parking lot from near the beach to an area less vulnerable to storm damage, restoration of dune habitat, and improved water quality.

Existing pavement would be removed from near the beach at the north, back 140 feet to the south. Additional pavement would be removed from the west side of the remaining parking area adjacent to the coastal dune. Vegetated bioretention swales would be created along the west and north sides of the remaining pavement to capture and treat stormwater. These tasks were scoped out by Horsley Whitten Group, including the required permitting and bidding for the project. See attached plans and estimates.

**Description:** The proposed retrofit concept consists of three main components as shown in the attached concept plan:

## **1. Restoration of coastal habitat**

Remove existing pavement (~10,300 sf) within 140 ft of beach. Actively restore a majority of this area back to a dune ecosystem. This will include bringing in sand from offsite (or possibly from excavated material at overflow parking—see below), installation of dune fencing, and the planting of appropriate vegetation (e.g., American Beach grass, Beach Plum, Bayberry, and Sea-side Goldenrod).

A boardwalk or trail connecting the beach and the parking lot will be integrated with the restoration design, as well as a bioretention facility (see below) and interpretive signage. An 8-foot wide path constructed of articulated concrete blocks (ACBs) would extend north from the remaining pavement to the entrance of the beach. This would allow continued vehicle access to the beach while not generating stormwater. These ACBs have proven to be very resilient to storm events. As erosion affects the beach, segments of the ACBs could be removed from the north end. A second seasonal boardwalk (Superdeck or equivalent) would be placed directly adjacent to the ACBs for foot traffic and to provide handicap access to the beach area.

The Town is currently working with the adjacent neighbor to the west of the landing on creating a vegetated dune and sturdy sand fence just north of the existing pavement (plan attached) as the transition from a full revetment to a dune habitat. We anticipate this to be completed in the spring of 2014.

For this restoration project, we anticipate the northern most 70 feet of former parking area will be filled with screened sand compatible with adjacent dune deposits. This area will be elevated approximately 4 feet above the elevation of the existing pavement, which would be similar to the elevation on the property to the east and west. This elevation will add to the resiliency of the dunes. South of there we will keep the back dune area at a slightly higher elevation than the existing parking lot. It is anticipated that the dunes will migrate south with prevailing winds. The area is approximately 125 feet by 67 feet, or 8,375 square feet. The volume of sand to be placed is approximately 5' deep for one half and 2' deep for the second half, or a total volume of 29,375 cubic feet, or 1090 cubic yards.

Beach grass plugs will be planted in the restored area in late fall and through the winter up until mid-April. Dormant culms will be planted 8" deep, with two to three stems per hole, spaced 12" to 18" apart. The Town typically coordinates the beach grass plantings using youth volunteers. In the back dune area, approximately 150 1-gallon beach plum and 50 1-gallon bayberry plants will be included in the beach grass planting area. Town staff and volunteers will weekly water the shrubs as needed through one growing season to ensure viability.

## **2. Retrofit of existing parking lot**

Remove ~2,800 sf of existing pavement along the western edge of the remaining parking lot (~15 ft x 150 ft-strip) and replace with a grass swale that will be used to convey road and parking lot runoff into a bioretention facility. These BMPs should be sized to manage at least 1" of runoff and will be planted with beach-appropriate grasses, shrubs, and ground cover. A curb cut and paved flume will be used at the channel inlet, and a simple spillway would be provided for overflow from the bioretention cell (frequent overflow is unlikely given the sandy soils). Interpretive signage should be

posted near the bioretention and trail access. The parking area would be restriped to accommodate at least 29 parking spaces (9 ft x18 ft) including 3 handicapped spaces and at least two bike racks. The drive aisle width would be between 24 ft and 31 ft (shown at 31 ft); a narrower width would provide more flexibility in the swale design. A location for trash dumpster/restroom facilities could be provided closer to the main entrance.

**3. Addition of pervious overflow parking:**

Construct an overflow parking lot (~ 8,600 sq ft) in the existing meadow located in the southeast portion of property. This parking area is proposed to be constructed with pervious asphalt and designed for 30 parking stalls (9 ft x18 ft) with a 24 ft drive aisle width. At an average elevation of 20 ft and native sandy subsoils, only a 18-24 inch- reservoir course would be required below the porous asphalt layer. Access to the overflow lot will be through a standard asphalt egress off of the existing entrance. Interpretive signage will be posted near the entrance to the overflow parking lot.



**REMOVE EXISTING PAVEMENT AND RESTORE DUNES TO EDGE OF PROPOSED LOT**

**WALKING PATH**

**BIORETENTION WITH INTERPRETIVE SIGNAGE ALONG PATH**

**BIKE RACK**

**APPROX. 140 FT**

**OVERFLOW**

**DUNE FENCE AROUND BIORETENTION**

**GRASS SWALE**

**29- 9' x 18' SPACES, INCLUDING 3 HANDICAPPED SPACES**

**REMOVE EXISTING PAVEMENT**

**SITE FACILITY**

**STANDARD ASPHALT**

**PERMEABLE PAVEMENT PARKING LOT**

**DUNE FENCE AROUND PERMEABLE PAVEMENT LOT**

**30- 9' x 18' SPACES**

**NOTES:**

- SEE BIORETENTION NOTES AND SPECIFICATIONS FOR ALL MATERIAL SPECIFICATIONS.
- CONTRACTOR RESPONSIBLE FOR SLOPE STABILIZATION AND SAFETY MEASURES DURING CONSTRUCTION. SIDE SLOPES TO BE 3:1 MAXIMUM SLOPE.
- LOAM AND SEED SIDE SLOPES PER SPECIFICATIONS. USE BIONET S150BN BIODEGRADABLE EROSION CONTROL BLANKET OR APPROVED EQUIVALENT TO STABILIZE ALL SIDE SLOPES. THE REMAINING DISTURBED AREA SHALL BE LOAM & SEEDED OR LANDSCAPED PER PLANTING PLAN.

**TYPICAL BIORETENTION SECTION**

OUTLET STRUCTURE  
TYPE VARIES - SEE PLANS

EROSION CONTROL BLANKET  
SEE NOTE (3)

9" PONDING DEPTH (MAX)

30" PLANTING SOIL  
SEE SPECIFICATION NO.

8" STONE

FILTER FABRIC  
MIRAFI 140N OR  
APPROVED EQUAL

**BIORETENTION FACILITY AT SANDY NECK PARKING LOT, MA**

**TYPICAL BIORETENTION FACILITY DETAIL**  
**NOT TO SCALE**

**GRAPHIC SCALE**

(in feet)

**1 INCH = 50 FEET**

[illegible]





# MEMORANDUM

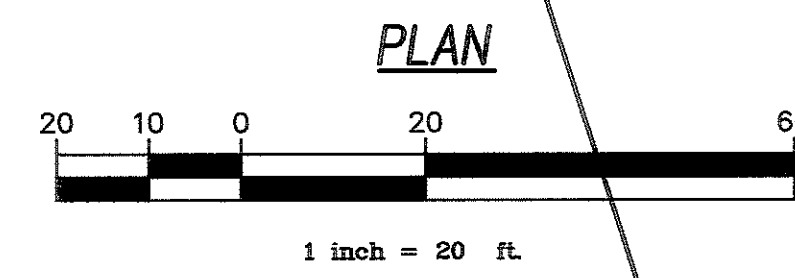
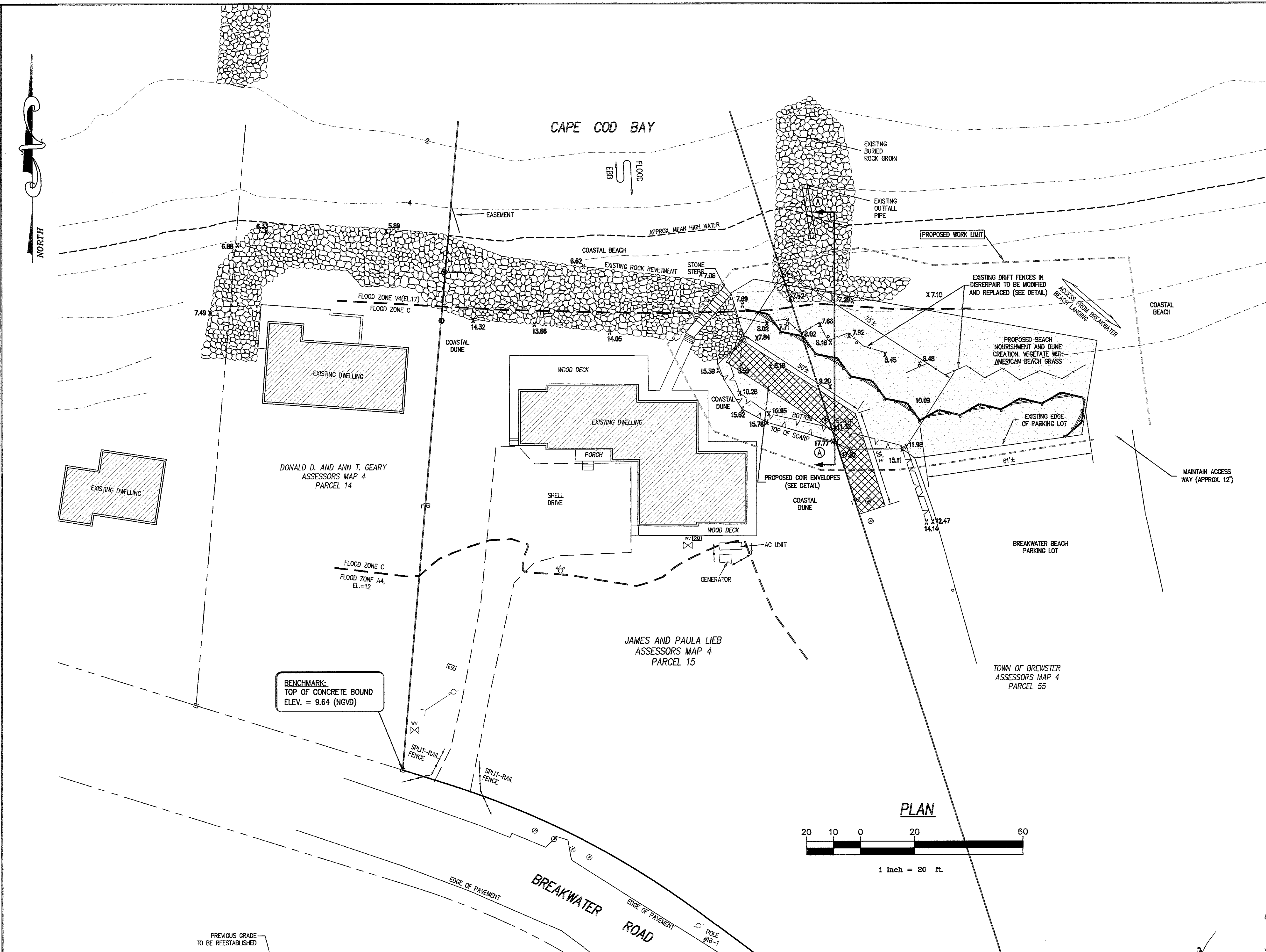
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DATE: February 19, 2014  
TO: Chris Miller  
FROM: Anne Kitchell Horsley Witten Group, Inc (HW).  
RE: Revised cost estimate for design and permitting of proposed Breakwater Landing retrofit and dune restoration project

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Per your request, this memo provides a cost estimate of **\$40,000** to be used in preparation of a proposal for the COASTAL COMMUNITY RESILIENCE GRANT PROGRAM FY14 grant. In generating this estimate, we assumed the following based on your 2/12/14 email:

1. HW services include 100% design, permitting, and preparation of bid documents for the retrofit of Breakwater Landing (based on our 1/17/14 concept sketch), as well as permitting for the dune restoration and beach access component as described in your email. Design and bid document preparation for the dune restoration and access component will be completed by another firm.
2. This estimate includes site survey and engineering design, permitting, and preparation of bid documents (Town to provide upfront material) and specifications.
3. The proposed project will result in activities within coastal dunes, a regulated resource area under the Massachusetts *Wetlands Protection Act* (M.G.L. Ch. 131 § 40) and the Code of the Town of Brewster Wetlands Protection, Chapter 172, *Brewster Wetlands Protection By-law*. The project will require permitting (Order of Conditions) through the local Conservation Commission and the Massachusetts Department of Environmental Protection (DEP) under a Notice of Intent (NOI) application. This estimate does not include any additional State-issued Permit or State agency review under the Massachusetts Environmental Policy Act (M.G.L. c. 30 §§ 61 through 62H, inclusive or MEPA) through an Environmental Notification Form (ENF). Based upon our understanding of the project, it does not appear that mandatory review through an Environmental Impact Report (EIR) would be required.
4. This estimate does not include construction or construction admin for the purposes of the CCR Grant.
5. There are two items listed in your project description that are included within this proposal-- participation in at least one public meeting and preparation of a recommended maintenance plan for Breakwater Landing stormwater BMPs.



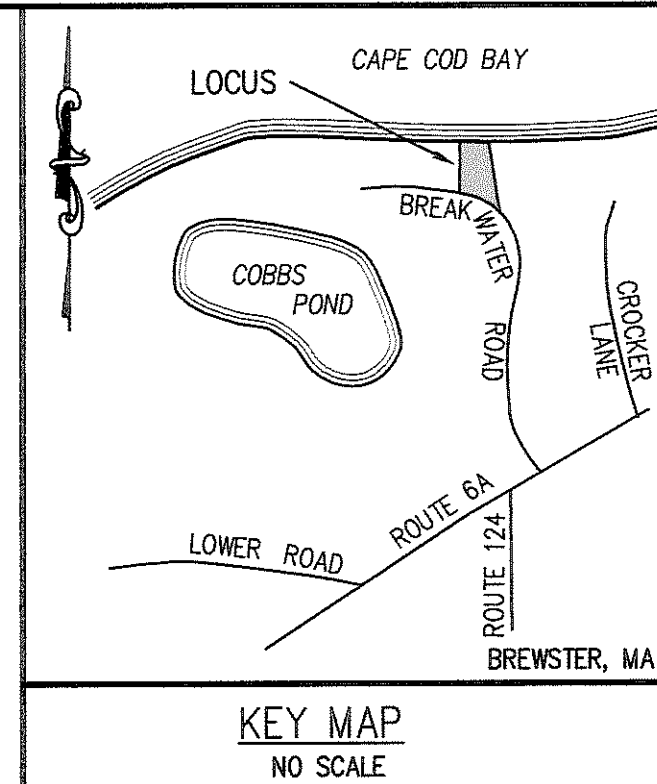
PLAN

GENERAL NOTES:

1. SUPPLY ALL MATERIAL, EQUIPMENT AND LABOR FOR THE MAINTENANCE OF EXISTING SHOREFRONT PROTECTION ALONG THE SHOREFRONT AS DESCRIBED AND SHOWN ON PLAN AND DETAILS.
2. PERFORMANCE OF THE WORK SHALL BE IN COMPLIANCE WITH THE PLAN AND DETAIL, ORDER OF CONDITIONS ISSUED BY THE BREWSTER CONSERVATION COMMISSION FOR THE REFERENCED PROJECT, CONSTRUCTION PROTOCOL, AND AS DESCRIBED BELOW.
3. ACCESS TO BE FROM BREAKWATER BEACH LANDING ADJACENT TO THE OWNER'S PROPERTY FOR MATERIAL AND EQUIPMENT. UPON COMPLETION, ALL DISTURBED AREAS TO BE RE-GRADED AND RE-VEGETATED TO MATCH PRE-CONSTRUCTION CONTOURS.
4. ANY FILL MATERIAL REQUIRED SHALL BE CLEAN COMPACTED COARSE SAND BROUGHT ONTO SITE BY CONTRACTOR.
5. UPON COMPLETION OF THE WORK, THE CONTRACTOR SHALL REPLACE THE BEACH TO MATCH THE ORIGINAL PROFILE.
6. DISTURBED UPLAND AREAS TO BE PLANTED WITH VEGETATION INDIGENOUS TO THE ENVIRONMENT, SUCH AS BEACH GRASS AND ROSA RUGOSA, UPON COMPLETION OF WORK.

INSPECTION AND MAINTENANCE NOTES: (REFER TO INSPECTION AND MAINTENANCE PROTOCOL)

1. THE SAND DRIFT FENCE SHALL BE INSPECTED AND MAINTAINED OVER ITS SERVICEABLE LIFE. MATERIAL FOR THE DRIFT FENCE POSTS TO BE NON-LEACHING PRESSURE TREATED (ACO), WHITE CEDAR, OR AS APPROVED BY ENGINEER. DRIFT FENCE BRACING SHALL BE NON PRESSURE TREATED LUMBER. ANY DAMAGED SECTIONS SHALL BE REPAIRED OR REPLACED.
2. THE BREWSTER CONSERVATION COMMISSION AGENT SHALL BE NOTIFIED PRIOR TO THE START OF ANY MAINTENANCE WORK.
3. THE BEACH NOURISHMENT SHALL COVER THE DRIFT FENCING UP TO 6".



PLAN REFERENCES:

ASSESSORS MAP 4 PARCEL 15  
PLAN BOOK: 79 PAGE: 5  
DEED BOOK: 9296 PAGE: 23  
FIRM COMMUNITY PANEL #250003 0008 D

DATUM NOTE:

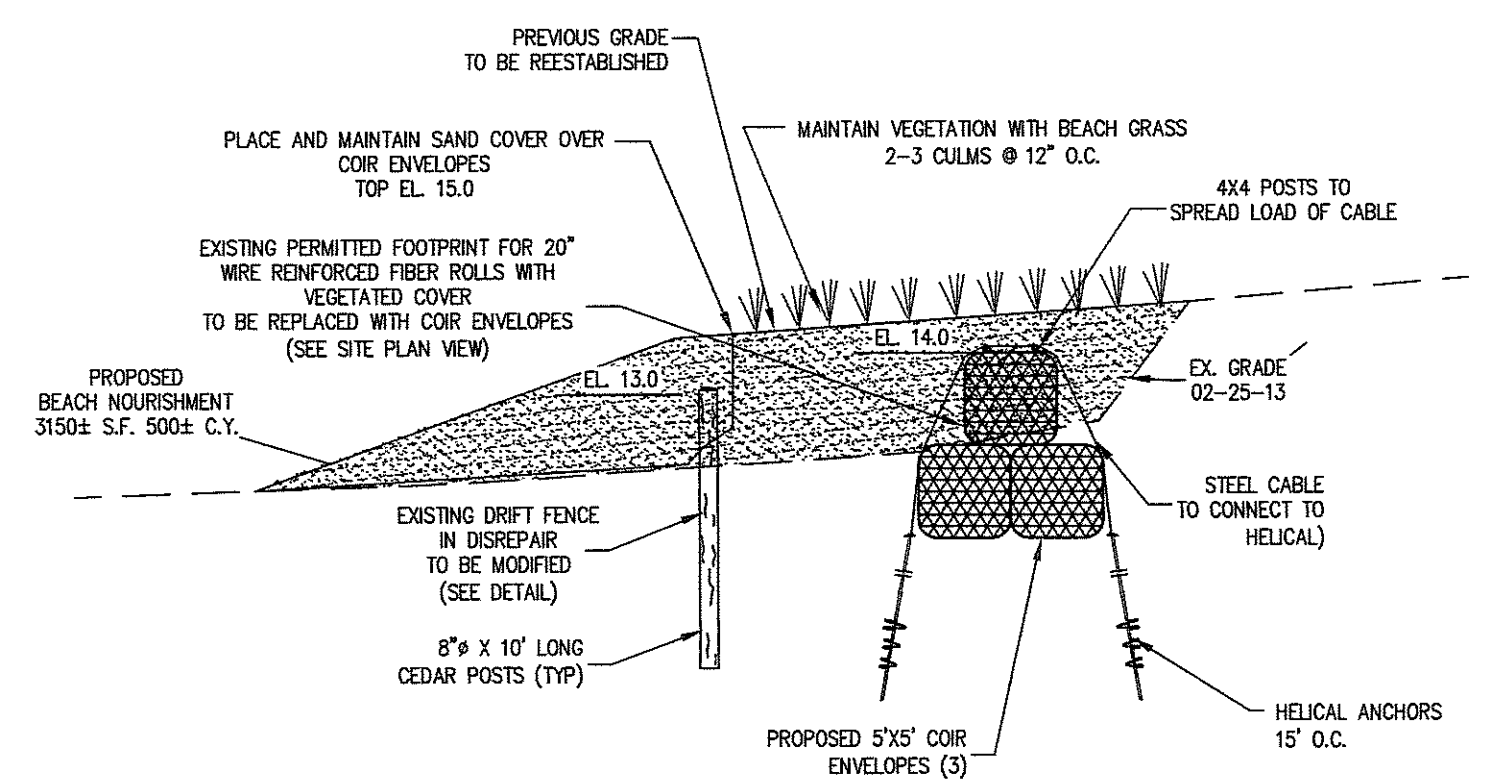
ELEVATIONS SHOWN HEREON ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD)

EXISTING SITE WORK PERMITTED UNDER FILE #SE9-1173 & SE9-1193

LEGEND

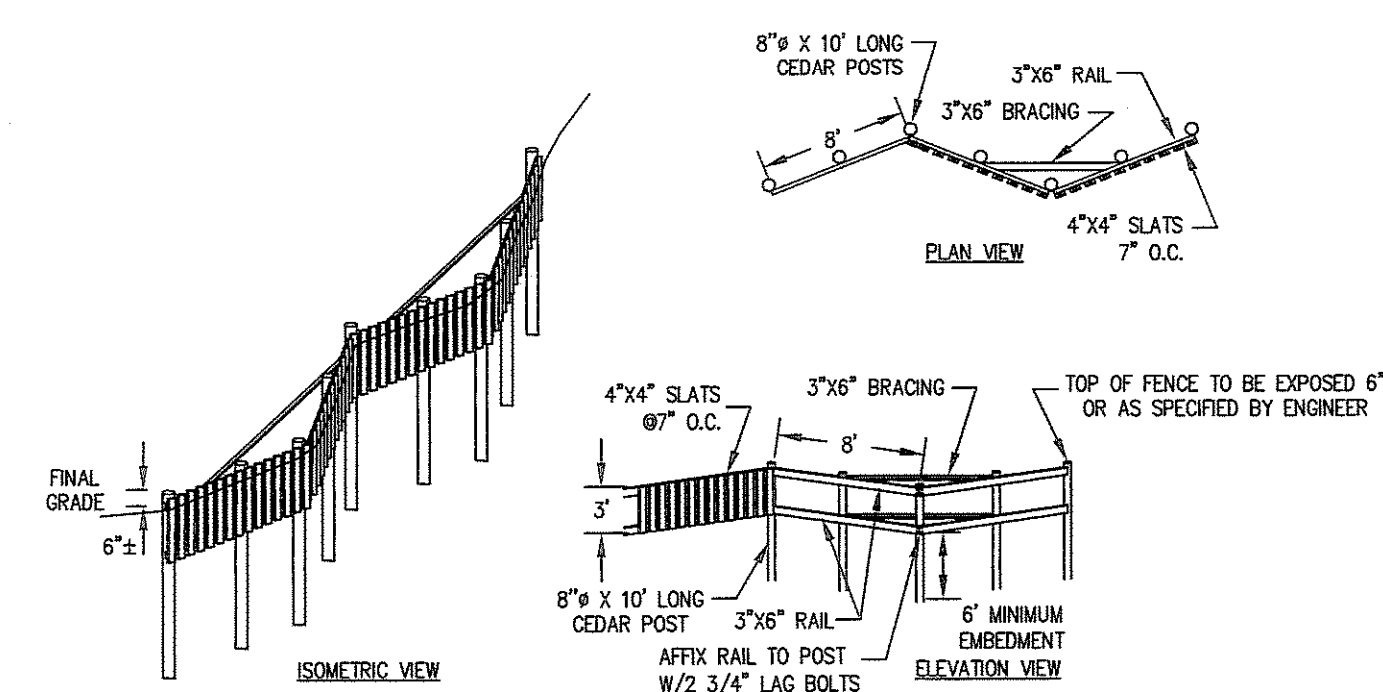
EXISTING

- BOUND
- GAS METER
- WATER VALVE
- IRRIGATION
- ELECTRIC METER
- MISC. SIGN
- UTILITY POLE
- GUY POLE
- GUY WIRE
- FENCE
- CONTOUR
- SPOT GRADE 02/25/13



SECTION A-A

SCALE 1" = 10'



TYPICAL DRIFT FENCE DETAIL

NOT TO SCALE

COASTAL ENGINEERING COMPANY, INC.  
260 Cranberry Hwy, Orleans, MA 02653  
508.255.6511 Fax: 508.255.6700

NO.	DATE	REVISION	BY
3	10-29-13	ADD SOUTHERLY RETURN AS DISCUSSED AT HEARING	JRN
2	10-15-13	REVISE COR ENVELOPE FOOTPRINT	JRN
1	8-28-13	REVISE DRIFT FENCE DESIGN, REMOVE FILTER FABRIC	JRN

PROJECT  
JAMES AND PAULA LIEB  
268 BREAKWATER ROAD  
BREWSTER, MA  
SHEET TITLE  
PROPOSED MAINTENANCE TO EXISTING SHOREFRONT PROTECTION

SCALE  
AS NOTED  
DRAWING FILE  
C15765-rev 02-2013.dwg  
DATE  
6-14-13  
DRAWN BY  
KES  
CHECKED BY  
JRN

C3.1.1  
1 OF 1 SHEETS  
PROJECT NO.  
C15765



## Amy Miller Ball, CWS

Project Manager - Senior Ecologist



### Areas of Expertise

- Wetland & Natural Resource Area Assessments
- Environmental Permitting & Compliance
- Rare Species
- Coastal Resources
- Training
- Meeting Facilitation

### Professional Registrations

- Certified Wetland Scientist, (C.W.S.) No. 230, NH

### Professional Affiliations

- Board of Directors, V.P. for Education, MA Association of Conservation Commissions (MACC)
- Member, Society of Wetland Scientists (SWS)
- Member, Association of MA Wetland Scientists (AMWS)

### Academic Background

Master of Science, Plant Biology, University of Massachusetts

Bachelor of Science, Biology, Muhlenberg College

Wetlands Wildlife of Southeastern MA Field Course, University of Massachusetts Cooperative Extension

Marine Phycology Summer Field Course, University of Washington

Barrier Island Ecology Summer Field Course, Duke University

Amy Ball has more than 18 years of professional experience as a wetlands scientist and ecologist specializing in wetland botany and ecology, rare species and wildlife habitat assessments, wetland restoration and mitigation, environmental assessment and monitoring, and environmental policy evaluation. As a project manager and senior ecologist with the Horsley Witten Group, Ms. Ball manages projects requiring inland and coastal wetland resource area determinations, wildlife habitat assessments, impact mitigation, and regulatory compliance. Ms. Ball also manages project permitting for projects requiring federal, state, regional, and local permits pursuant to laws, regulations, and policies governing water resource and rare species protection. Ms. Ball frequently appears before local conservation commissions and state and federal regulatory authorities as a project representative or reviewing consultant, and has provided expert testimony in defense of a wetland boundary determination and as a municipal consultant at Massachusetts Department of Environmental Protection adjudicatory hearings.

### REPRESENTATIVE PROJECTS

#### Provincetown Municipal Airport, Provincetown, MA (on-going):

Project manager for wetlands and wildlife components associated with the implementation of the Airport's Capital Improvement Program. Project involvement includes wetland delineation of freshwater and coastal resource areas, wildlife habitat assessments, and rare species habitat surveys for four Massachusetts- listed species, as well as assisting in the preparation of various reports and public presentations. Responsible for assisting project team with permitting and coordination with Federal, State, Regional and local regulatory agencies. Required permits and review include: Section 404 Individual Permit and Section 401 Water Quality Certification (WQC) under the Federal Clean Water Act; Coastal Zone Management (CZM) Consistency Review; a Decision from the Cape Cod Commission Development of Regional Impact; MESA Project Review under the Massachusetts Endangered Species Act (MESA); and an Order of Conditions under the Massachusetts Wetlands Protection Act, in addition to review under the National Environmental Policy Act (Environmental Assessment) and the Massachusetts Environmental Policy Act.

**Sandy Neck Beach Facility, Barnstable, MA:** Project manager responsible for permitting the reconstruction of the existing bathhouse and concession stand, construction of a storage garage, and extension of a walking path to improve safety conditions along Sandy Neck Road. Environmental constraints, including numerous coastal and freshwater resource areas and rare species habitat within a Massachusetts designated Area of Critical Environmental Concern (ACEC) presented design challenges for the design team and the Town to present an



**Amy Miller Ball, CWS**  
Project Manager - Senior Ecologist

environmentally sound project design that is sensitive to the delicate ecosystem while meeting the needs of the Town to provide an enjoyable and educational beach facility. Permitting requirements included obtaining an Order of Conditions under the state and local wetlands laws as well as review under the Massachusetts Endangered Species Act.

**Fuller Brook Park Preservation Project, Wellesley, MA (on-going):** Wetlands permitting manager for the rehabilitation of Fuller Brook Park including improvements to an existing multi-use path, and a series of mitigation of measures to restore habitat and hydrologic function to Fuller Brook and its tributaries. Permitting and review required through several federal, state, and local regulatory agencies including a waiver for the use of herbicides on select non-native invasive species on Town-owned property.

**Permitting for Stormwater Retrofit Projects, Peabody, MA:** As part of a comprehensive City-wide flood management and stormwater improvements project, Ms. Ball was responsible for local, state, and federal wetlands permitting of targeted LID retrofit projects in several locations throughout the City of Peabody. Retrofit sites to date include four locations within existing but unmaintained detention basins within an industrial park, and one within a brownfields site in the downtown area, each posing particular permitting complications, requiring careful coordination between the City, the project team, and the permitting agencies. Some of the retrofit projects permitted during earlier phases of this master plan project were constructed in 2010.

**Eel River Headwaters Restoration Project, Plymouth, MA:** Responsible for wetlands permitting at the State, Federal, and local levels for the precedent-setting restoration effort within the headwaters of the Eel River. Restoration efforts include converting approximately 40 acres of retired commercial cranberry bogs to a natural riparian wetland system and removing a portion of an historic stone sawmill dam, and converting these areas into critical wetland and cold-water stream habitat. Restoration will create a more natural hydraulic gradient, improving fish passage and overall water quality within the Eel River. Permits included: Section 404 Programmatic General Permit (PGP) under the Federal Clean Water Act; CZM Consistency Review; and an Order of Conditions under the Massachusetts Wetlands Protection Act, in addition to review under National Environmental Policy Act and the Massachusetts Environmental Policy Act.

**Bass Creek, Yarmouth, MA:** On behalf of the Town of Yarmouth Massachusetts Wetland Restoration Program (MWRP), responsible for coordinating permitting at the State, Federal, and local levels for the restoration of approximately 35 acres of salt marsh by enhancing tidal influence to a degraded salt marsh along Bass Creek, and restoring a more native plant community and improved water quality. Permits included: Section 404 (PGP) and Section 401 (WQC) permitting under the Federal Clean Water Act; CZM Consistency Review; a Chapter 91 Waterways License; MESA Project Review under MESA; and an Order of Conditions under the Massachusetts Wetlands Protection Act, in addition to review under the Massachusetts Environmental Policy Act.

**Richard A. Claytor, Jr., P.E.**

President

**Areas of Expertise**

- Wetland and Natural Resource Area Assessments
- Environmental Permitting & Compliance
- Smart Growth/ Low Impact Development
- Watershed Planning & Assessment
- Civil Engineering
- Environmental Engineering
- Stormwater Management
- Surveying
- Site Design
- Training

**Professional Registrations**

- Professional Engineer Massachusetts, New Hampshire, New York, and Maryland
- Massachusetts Certified Soil Evaluator
- LEED Accredited Professional

**Professional Affiliations**

- Massachusetts DEP Stormwater Policy Advisory Committee
- Town of Sandwich, Massachusetts Planning Board, 2007 to 2011
- American Society of Civil Engineers

**Academic Background**

Bachelor of Science, Union College, Civil Engineering, Concentration in Hydrology, Hydraulics, Water Resources, and Geotechnical Engineering

Rich Claytor has more than 30 years of practical experience in civil and environmental engineering with specific expertise in water resource planning, design, implementation, research, education, and training. Rich has extensive experience and expertise in stormwater management design, implementation, program assessment, policy and evaluation. Rich also is experienced in watershed planning, training and education; water resource permitting and research; water supply and wastewater design; land use planning, site design and research; storm drainage, erosion/sediment control, roadway design; and construction administration. He has authored a variety of stormwater manuals and publications on stormwater policy, design and implementation, and presented at dozens of training workshops and conferences over the last two decades. He has served as the principal designer of stormwater management and stream restoration measures for a wide range of projects throughout New England and the Mid Atlantic.

**REPRESENTATIVE PROJECTS****Roger Williams Park Water Quality Improvement Plan, Providence, RI:**

Principal Engineer for this EPA funded restoration project to improve the water quality and biodiversity conditions of the Park's urban ponds. The focus of this project is on the development of a water quality improvement plan to include a watershed assessment including pollutant-loading analyses, the establishment of long- and short-term water quality goals, identification of feasible stormwater retrofits, assessment of in-pond treatment options, and design, permitting, and construction administration of the five highest priority stormwater retrofit BMPs.

**Bridgewater State University West Campus Parking Improvements,**

**Bridgewater, MA:** Principal-in-Charge for design and construction administration for a 340 space parking and open space improvement project that included environmental permitting, plan and specification documents and construction oversight. The stormwater management system serving the project was designed to incorporate a series of low impact development treatment systems and incorporated stormwater monitoring components for use by the University in their science courses curriculum.

**Low Impact Design Stormwater Retrofit for Perkins Street, Peabody,**

**MA:** Principal-in-Charge for the assessment and design for three separate low impact development retrofit sites to help alleviate localized flooding, enhance water quality, and improve safety conditions at the intersection of Perkins Street and Allens Lane. The Plan includes a variety of innovative, feasible and cost-effective stormwater practices constructed on publically-owned park land and rights-of-way.

**Samoset Street Outfall Assessment and Engineering, Plymouth, MA:**

Lead Design Engineer for the completion of comprehensive stormwater management improvements for the Town. The Samoset Street outfall discharges into historic Plymouth Harbor, a 303(d) listed impaired water body. Rich directed the assessment of existing road drainage conditions,

**Richard A. Claytor, Jr., P.E.**  
President

water quality sampling, soil evaluation, and design of roadway stormwater improvements and several BMPs.

**Centennial Park Detention Basin Retrofit and Wetland Restoration, Peabody, MA:** Principal-in-Charge for this project to develop a restoration plan that improves the wetland function and provide enhanced stormwater management for the Centennial Park Industrial Park, an area that often experiences severe flooding. Services include: design plans, environmental permitting, and assistance with construction bidding, project management, and oversight.

**Bare Hill Pond Village Stormwater Master Plan and Implementation, Harvard, MA:** Principal Engineer for the identification, assessment, prioritization, design and implementation of more than a half-dozen “green infrastructure” control measures to retrofit stormwater management for the 100 acre village center of Harvard, MA. Measures included an off-line submerged gravel wetland for enhanced phosphorus treatment.

**Roadway Drainage Improvements and Stormwater Treatment, Plymouth, MA:** As part of a municipal capital improvements program, with additional funding from the Massachusetts 319 Non-Point Source Grant Program, Rich directed the development of construction-ready plans and specifications for three water quality treatment sites and seven roadway stormwater and traffic improvement projects throughout the Town.

**Brackett Landing Mixed Use Development, Eastham, MA:** Principal-in-Charge for the planning, design and permitting of this small-scale traditional neighborhood design (TND) project in the Town of Eastham, Massachusetts. The project incorporates a mix of commercial and residential lands uses, a village common, and a pedestrian-friendly streetscape within the context of LID stormwater management and advanced nitrogen removing wastewater management. Permits for water supply, wastewater and stormwater management were secured through the Town of Eastham, and the Massachusetts Department of Environmental Protection.

**Chepachet Village Integrated Water Management Planning and Design, Glocester, RI:** Project Manager for a village scale wastewater and stormwater management study in Chepachet Village, Glocester, RI. This project evaluated existing water management problems and developed neighborhood-scale solutions designed to address flooding and water quality issues. Under his supervision, HW designed and oversaw the installation of the first constructed stormwater wetlands designed to meet the criteria of the 2010 RI Stormwater Design and Installation Standards Manual.

**Thornton Burgess Society’s Green Briar Nature Center, Sandwich, MA:** Lead designer for the site design to accommodate a new educational building. Rich directed the design of a new gravel parking lot and paved driveways for the new educational building. The project included the design of three bioretention facilities, a water quality swale and permeable pavers in overflow parking areas. HW prepared construction-ready plans and specifications, secured all relevant permits and provided construction administration services. The firm continues to provide technical guidance and oversight on the maintenance of the LID system for the Thornton Burgess Society.

**Sawmill Pond Watershed Plan, North Kingstown, RI:** Principal-in-Charge for the preparation of a comprehensive watershed management plan to improve surface and ground water quality in Sandhill Brook and Sawmill Pond. The project includes a stormwater management assessment for the project area, identifying and conceptually designing stormwater retrofit facilities at key locations throughout the watershed. These concepts were used to obtain grant funding, and are scheduled to be constructed in 2013.



**Michelle L. West, P.E.**

Project Manager - Water Resources Engineer



**Areas of Expertise**

- Smart Growth/ Low Impact Development
- Watershed Planning & Assessment
- Geographic Information Systems
- Civil Engineering
- Environmental Engineering
- Stormwater Management
- Site Design
- Low Impact Design
- Training
- Meeting Facilitation

**Professional Registrations**

- Professional Engineer, MI

**Professional Affiliations**

- Member, Conservation Commission, Town of Falmouth, 2007 to Present
- Waquoit Bay National Estuarine Research Reserve, Volunteer

**Academic Background**

Master of Science, Engineering,  
College of Civil and  
Environmental Engineering,  
University of Michigan

Bachelor of Science,  
Engineering, College of Civil  
and Environmental Engineering,  
University of Michigan

Bachelor of Science, School  
of Natural Resources and  
Environment, University of  
Michigan

Michelle West, P.E., has twelve years of professional experience in civil and environmental engineering. Her specific expertise is in stormwater management, watershed planning, hydraulic/hydrologic modeling, and low impact development (LID) planning, assessment, design, and implementation. She has prepared materials for and presented at several technical training workshops on stormwater issues, LID, and erosion and sediment control (ESC). She also has experience with public education and outreach, particularly as part of municipal NPDES Phase II stormwater plan implementation, as well as with geographic information system (GIS) mapping, analysis, and modeling.

**REPRESENTATIVE PROJECTS**

**Stormwater Assessment for Bare Hill Pond, Harvard, MA:** Performed a watershed assessment and provided recommendations for stormwater retrofits for eight target drainage areas tributary to Bare Hill Pond, which suffers from high nutrient and sediment loadings, as well as invasive vegetation. Designed LID practices such as gravel wetlands, swales, and bioretention facilities to help reduce pollutant inputs to the pond. Six of the practices were constructed in 2010, with two more completed in Spring 2013.

**Pilot Project for Meeting the Charles River Phosphorus TMDL for the Spruce Pond Subwatershed, Franklin, MA:** In cooperation with the Charles River Watershed Association, HW provided technical assistance and engineering support to identify restoration approaches to restore hydrologic integrity and develop stormwater “green infrastructure” retrofit concepts for the Spruce Pond Watershed. Michelle was the Project Engineer, providing the following services: training for CRWA staff on how to conduct a retrofit inventory; field reconnaissance to identify retrofit sites; evaluation and conceptual design and cost estimates for retrofit options; site selection support; and technical peer review of CRWA’s assessment report.

**Herring Brook Stormwater Improvements Project, Weymouth, MA:** The Massachusetts Division of Marine Fisheries identified adverse impacts on the herring and smelt habitat in Herring Brook due, in part, to excessive sediment loading from stormwater discharges. Michelle conducted a watershed assessment of the 550-acre urbanized study area using GIS and field reconnaissance. This assessment was used to identify the most effective locations for stormwater retrofits and most appropriate practice at each location. She was the lead engineer on the BMP design for the top three priority sites, including an underground sand filter and two gravel wetlands.

**Stormwater Retrofit Fieldwork and Assessment for Peconic Estuary, Long Island, NY:** Performed a watershed field assessment and provided recommendations for stormwater retrofits to address



**Michelle L. West, P.E.**

Project Manager - Water Resources Engineer

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water quality issues in four pilot watersheds in the Peconic Bay Estuary region. Conceptually designed management practices such as stormwater wetlands, swales, sand filters, and bioretention facilities and ranked projects to aid local communities with implementing the most cost effective and beneficial projects with limited funds. Prepared watershed assessment guide to support plan development for remaining watersheds in the area.

**Chepachet Village Integrated Water Management Planning and Design, Glocester, RI:** Michelle was a Project Engineer for this village-scale wastewater and stormwater management study in Chepachet Village, Glocester, RI. The goal of this study was to resolve existing water management issues, using neighborhood-scale solutions designed to address flooding and water quality issues. Michelle developed a conceptual design of innovative stormwater solutions for village roadways, incorporating grassed swales, bioretention systems, infiltration basins, and wet vegetated treatment systems into the existing stormwater management system. In 2012, the wet vegetated treatment system concept was fully designed and constructed, integrating stormwater management with the surrounding parkland, historical sites, and wetland areas.

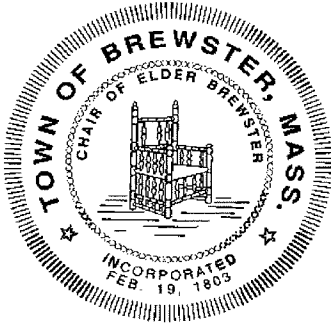
**Savin Hill Cove Sediment Erosion and Transport Assessment, Boston, MA:** Michelle conducted an assessment of potential erosion and scour in Savin Hill Cove resulting from proposed changes in stormwater discharge from improvements associated with the Morrissey Boulevard Drainage Conduit Project. She evaluated in-channel flows and velocities in the cove using the Storm Water Management Model (SWMM) RUNOFF module and US Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) model.

**Upper Charles River Sustainable Stormwater Funding Assessment, Bellingham, Franklin, & Milford, MA:** Project engineer for the assessment and dissemination of a technical report documenting the feasibility of widespread implementation of stormwater control measures to meet TMDL requirements and the requirements for a sustainable funding source through a Stormwater Utility structure.

**Roger Williams Park, Providence, RI:** Project engineer for this EPA funded restoration project to improve the water quality and biodiversity conditions of the Park's urban ponds. The focus of this project was on the development of a water quality management plan to include a watershed assessment including pollutant-loading analyses, the establishment of long- and short-term water quality goals, identification of feasible stormwater retrofits, assessment of in-pond treatment options, and design, permitting, and construction administration of the five highest priority stormwater retrofit BMPs.

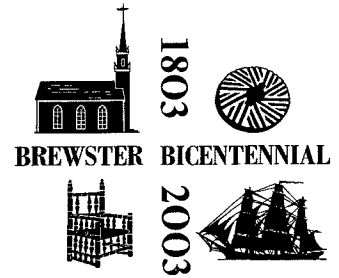
**Rhode Island Stormwater Design and Installations Manual Update and LID Site Planning and Design Guidance for Communities:** Lead Engineer for this project that updated the statewide Rhode Island Stormwater manual to incorporate LID practices for all new and redevelopment projects. This strategy integrated site design criteria with structural stormwater practices for the first time to create a comprehensive stormwater management approach. She developed and presented training workshops for agency staff, as well as for engineers and developers, to describe the new manual and introduce new concepts. She also helped prepare a companion guidance document for Rhode Island municipalities that facilitates the implementation of LID at the local level.

**Feasibility Study and Conceptual Design for Affordable Housing, Falmouth and Marion, MA:** Assisted with site evaluation and conceptual design for town-owned property in Falmouth and Marion. Feasibility criteria included assessing wetlands, identifying priority habitat areas, and evaluating wastewater and stormwater issues. Site layouts minimize impervious surfaces, preserve open space, and incorporate LID stormwater management practices such as bioretention facilities and infiltration systems. Attended public hearings to present alternative concepts and gather feedback from the community.



**Board of Selectmen  
Town Administrator**

2198 Main Street  
Brewster, Massachusetts 02631-1898  
(508) 896-3701  
FAX (508) 896-8089



Julia Knisel  
Coastal Shoreline & Floodplain Manager  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Coastal Community Resilience Grant Program FY14

Dear Ms. Knisel,

Please be advised that I, Charles L. Sumner, am the authorized signatory for the Town of Brewster.

The Town commits to match 25% of the total Coastal Community Resilience grant project's costs and acknowledges that funding is to be provided by the state on a reimbursement basis.

Matching funds are in the process of being approved by Brewster's authorizing body, Town Meeting. (Please see attached Article No.8 for May 2014 Town Meeting)

Sincerely,

Charles L. Sumner  
Town Administrator

Att. Article No. 8

**ARTICLE NO. 8:** To see if the Town will vote to authorize the Board of Selectmen to apply for and accept a grant under the Coastal Community Grant Program, and to transfer the sum of **FORTY THOUSAND AND 00/100 DOLLARS (\$40,000.00)** from item no. 8b. (Paines Creek Culvert Project) of article no. 8 of the May 2012 Annual Town Meeting Warrant and **TEN THOUSAND AND 00/100 DOLLARS (\$10,000.00)** from item no. 1c. (Cape Cod Water Resources Restoration Project) of article no. 8 of the 2010 Annual Town Meeting Warrant and to expend those funds for the purposes for which said grants are authorized, or to take any other action relative thereon.

The Town has applied for a grant from the Massachusetts Coastal Zone Management Agency in order to conduct an evaluation of the fate and transport of sediment across the coastline, which will help us understand long term erosion rates. This will be followed by having an engineer evaluate each of our coastal access points/landings; and develop a permit defining an ongoing maintenance and repair plan. One of the benefits of this program is that these landing and beaches will then be considered "engineered beaches" under the Federal Emergency Management Agency guidelines, which will enhance the Town's reimbursement possibilities in the event of a federally declared disaster event.

In addition this grant will assist the Town in developing a series of short term and longer term objectives relative to the affects due to storms, sea level rise, subsidence, and changes on the coastline. In addition we will also develop plans for coastal resilience and retreat at three key landings; Ellis, Mant's and Breakwater. Additionally the Town will have a series of "shovel ready" projects for future grant round opportunities.

**Total Project Cost: \$268,000**

**Town's Match Amount** (at least 25% of TOTAL project cost): **\$68,000 (\$50,000 cash, \$18,000 in-kind)**

**Grant Amount Requested: \$200,000**



**5e. Replace Eddy School Water Faucets** – These funds will be used to replace the original bathroom and classroom water faucets that are leaking.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

**5f. Carpet & Tile Replacement/Repair Project** – These funds will be used to complete a multi-year replacement of worn carpet and tile at the Stony Brook School.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

## **6. NATURAL RESOURCES DEPARTMENT**

**6a. Architectural/Feasibility Study for Natural Resources Building** - The Natural Resources Department currently occupies a building located at 1708 Main Street consisting of a three bay garage and office area. This study will look at the costs associated with moving the department from this location, in terms of the design and construction costs to create a suitable building adjacent to the former Water Department garages at 1673 Main Street.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

**6b. Freemans Pond Culvert Replacement Project** – The Town is replacing a damaged and undersized culvert leading to Freemans Pond under a grant program obtained from the United States Department of Agriculture Natural Resources Conservation Services. These funds represent the town's share of the project costs. The project will restore 15 acres of salt marsh and provide additional storm damage prevention.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

**6c. Ellis Landing Engineering Services** - Significant erosion issues at Ellis Landing have resulted in damage to the landing and beach access. Existing subsurface storm-water controls no longer function, which results in erosion, siltation of shellfish beds and additional pollutants flowing into the public beach. These funds would be used for permitting, design, and preparation of a cost estimate associated with repair of the landing.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

**6d. Millsites Accessibility Improvement Project** – The Town has applied for a State Parkland Acquisition and Renovation for Communities (PARC) grant for the Stony Brook Millsites area. This grant would provide 52% of the costs to control invasive species, manage vegetation, improve accessibility to the site, including trails and observation areas, and provide additional interpretive signs. These funds would provide for the initial permitting and design costs for the first year of the two year grant project. This project would be undertaken along with the ongoing reconstruction of the failing dam and fish passage, which should allow significant matching funds to reduce the town's obligations under this grant program.  
**BOS: 5-YES; 0-NO; 0-ABSTAINED      FCR: 9-YES; 0-NO; 0-ABSTAINED**

STONY BROOK TOWN  
Nov. 2011

c. Fire Engine Lease/Purchase Payment Expense	\$108,000.00
d. Ambulance Vehicle Replacement Project	\$160,000.00
e. SCBA Equipment Lease/Purchase Payment	\$30,000.00
f. Fire Building Renovation Project	\$50,000.00
g. Personal Protective Equipment Acquisition	\$6,882.00
h. CMED Program Funding	<u>\$6,530.00</u>
<b>Sub-total</b>	<b>\$410,412.00</b>

**3. Board of Selectmen:**

a. Water Planning Professional Services Expense	\$95,000.00
b. COA Telephone System & Computer Network Project	\$9,014.00
c. Veterans Memorial Project	<u>\$1,000.00</u>
<b>Sub-total</b>	<b>\$105,014.00</b>

**4. Water Department:**

a. Vehicle Replacement	\$35,000.00
b. Water Construction Account	\$180,000.00
c. Pump Station Modification Project	<u>\$22,900.00</u>
<b>Sub-total</b>	<b>\$237,900.00</b>

**5. Elementary School Department:**

a. HVAC Maintenance & Repairs	\$75,000.00
b. Technology Project	\$30,000.00
c. Replace Tractor & Lawn Mower	\$42,000.00
d. Replace & Repair Gutters at Stony Brook School	\$20,000.00
e. Replace Eddy School Water Faucets	\$11,500.00
f. Carpet & Tile Replacement	<u>\$7,000.00</u>
<b>Sub-total</b>	<b>\$185,500.00</b>

**6. Natural Resources Department:**

a. Architectural/Feasibility Study for Natural Resources Facility	\$15,360.00
b. Freemans Pond Culvert Replacement Project	\$25,000.00
c. Ellis Landing Engineering Services	\$10,000.00
d. Millsites Site and Accessibility Improvement Project	<u>\$80,000.00</u>
<b>Sub-total</b>	<b>\$130,360.00</b>

**7. Ladies Library:**

a. Ladies Library Telephone System Replacement Project	\$10,152.00
b. Technology Improvement Project	<u>\$24,500.00</u>
<b>Sub-total</b>	<b>\$34,652.00</b>

**8. Police Department:**

a. Portable Radio Replacement Program	\$16,182.00
b. Animal Control Vehicle Replacement	\$25,000.00
c. Security Camera Equipment	\$14,500.00
d. Emergency Planning Fund	<u>\$10,000.00</u>
<b>Sub-total</b>	<b>\$65,682.00</b>

**COMMONWEALTH OF MASSACHUSETTS  
CONTRACTOR AUTHORIZED SIGNATORY LISTING**

Issued May

2004



**CONTRACTOR LEGAL NAME :**

**CONTRACTOR VENDOR/CUSTOMER CODE:**

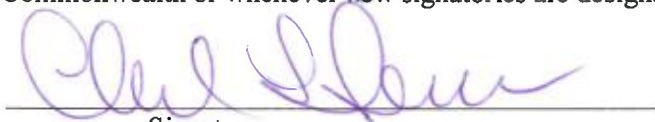
**INSTRUCTIONS:** Any Contractor (other than a sole-proprietor or an individual contractor) must provide a listing of individuals who are authorized as legal representatives of the Contractor who can sign contracts and other legally binding documents related to the contract on the Contractor's behalf. In addition to this listing, any state department may require additional proof of authority to sign contracts on behalf of the Contractor, or proof of authenticity of signature (a notarized signature that the Department can use to verify that the signature and date that appear on the Contract or other legal document was actually made by the Contractor's authorized signatory, and not by a representative, designee or other individual.)

**NOTICE:** *Acceptance of any payment under a Contract or Grant shall operate as a waiver of any defense by the Contractor challenging the existence of a valid Contract due to an alleged lack of actual authority to execute the document by the signatory.*

For privacy purposes **DO NOT ATTACH** any documentation containing personal information, such as bank account numbers, social security numbers, driver's licenses, home addresses, social security cards or any other personally identifiable information that you do not want released as part of a public record. The Commonwealth reserves the right to publish the names and titles of authorized signatories of contractors.

AUTHORIZED SIGNATORY NAME	TITLE
Charles L. Sumner	Town Administrator

I certify that I am the President, Chief Executive Officer, Chief Fiscal Officer, Corporate Clerk or Legal Counsel for the Contractor and as an authorized officer of the Contractor I certify that the names of the individuals identified on this listing are current as of the date of execution below and that these individuals are authorized to sign contracts and other legally binding documents related to contracts with the Commonwealth of Massachusetts on behalf of the Contractor. I understand and agree that the Contractor has a duty to ensure that this listing is immediately updated and communicated to any state department with which the Contractor does business whenever the authorized signatories above retire, are otherwise terminated from the Contractor's employ, have their responsibilities changed resulting in their no longer being authorized to sign contracts with the Commonwealth or whenever new signatories are designated.

  
Signature

Date: February 26, 2014

Title: Town Administrator

Telephone: 508-896-3701

Fax: 508-896-8089

Email: csumner@town.brewster.ma.us

[Listing can not be accepted without all of this information completed.]

A copy of this listing must be attached to the "record copy" of a contract filed with the department.

COMMONWEALTH OF MASSACHUSETTS  
CONTRACTOR AUTHORIZED SIGNATORY LISTING

Issued May

2004



CONTRACTOR LEGAL NAME :  
CONTRACTOR VENDOR/CUSTOMER CODE:

PROOF OF AUTHENTICATION OF SIGNATURE

This page is optional and is available for a department to authenticate contract signatures.  
It is recommended that Departments obtain authentication of signature for the signatory  
who submits the Contractor Authorized Listing.

This Section MUST be completed by the Contractor Authorized Signatory in presence of notary.

Signatory's full legal name (print or type): Charles Lorne Sumner

Title: Town Administrator

X

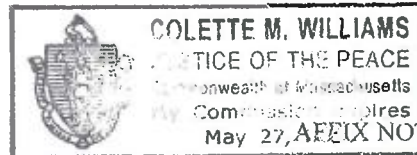
Signature as it will appear on contract or other document (Complete only in presence of notary):

AUTHENTICATED BY NOTARY OR CORPORATE CLERK (PICK ONLY ONE) AS FOLLOWS:

I, Collette Williams (NOTARY) as a notary public certify that I witnessed  
the signature of the aforementioned signatory above and I verified the individual's identity on this date:

February 26, 20 14

My commission expires on: May 27, 2016



AFFIX NOTARY SEAL

I, \_\_\_\_\_ (CORPORATE CLERK) certify that I witnessed the  
signature of the aforementioned signatory above, that I verified the individual's identity and confirm the individual's  
authority as an authorized signatory for the Contractor on this date:

\_\_\_\_\_, 20 \_\_\_\_.

AFFIX CORPORATE SEAL



## Town of Brewster

2198 Main Street  
Brewster, MA 02631-1898  
Phone: (508) 896-3701  
Fax: (508) 896-8089

Office of:  
Board of Selectmen  
Town Administrator

February 25, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel:

The Town of Brewster is pleased to submit its proposal- *Building Coastal Resilience in Brewster*- to the Massachusetts Office of Coastal Zone Management to support the Town's efforts to understand and plan for coastal change and to increase the resiliency of our coastal infrastructure, beaches, dunes and marshes. Brewster has 6 miles of coast on Cape Cod Bay that takes the brunt of winter storms, nor'easters and hurricanes. The combination of open fetch to the northwest and northeast winds, and tidal ranges that reach over 10 feet makes Brewster especially vulnerable to coastal storms and storm surge.

In the past five years, rather than armoring, we were proactive in retreating from one public beach parking lot that sustained repeated storm damage. We have other public beach parking areas and access points that have been storm damaged and, because of their location along the shore, are interfering with the function of the beach/dune/wetland complex at their locations. This proposal specifically addresses three of those locations with measured retreat and adaptation.


Brewster's proposal lays out a comprehensive science-based approach to assessment, planning, and design of a coastal resiliency program. We recognize the importance of integrating coastal science, data on our changing coastline, estimates of future sea level rise and the public participation in guiding our planning for a sustainable future. This work will be led by the Town's Department of Natural Resources and will include the Conservation Commission, the Planning Department, the Department of Public Works and our Fire & Rescue Department as our Emergency Management Coordinator. The three engineering firms we are partnering with are experts in their field, and Brewster has a record of successful projects with each firm.

The Board of Selectmen are appointing a Coastal Committee made up of citizen volunteers that will work with the Brewster Department of Natural Resources to review and guide development of the recommendations for short and long term actions. The proposed sediment fate and transport study will be shared with our neighboring communities of Dennis and Orleans, and with the Massachusetts Department of Conservation and Recreation's Nickerson State Park, giving them valuable information on how the extensive sand flats off our shorelines function and how it will likely change as our climate warms and sea level rises. Brewster intends to work with these communities and Nickerson State Park on developing a regional approach to coastal change.

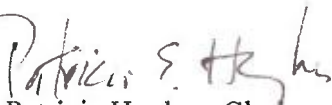
As the board responsible for setting town policies and priorities, we believe the work laid out in this proposal is critical to our future coastal management decisions. As a demonstration of Brewster's commitment to this work, the Town will contribute \$50,000 in cash match and \$18,000 of in-kind match.

Brewster has demonstrated experience in managed retreat and coastal restoration. We urge you to support this important proposal to build coastal resilience.


Sincerely,

  
Brewster Board of Selectmen

John Dickson, Chairman

  
Patricia Hughes, Clerk

  
Benjamin deRuyter

  
James Foley, Vice-Chairman

  
Peter Norton





# Town of Brewster

2198 MAIN STREET  
BREWSTER, MASSACHUSETTS 02631-1898

Office of: CONSERVATION COMMISSION

February 18, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

As Chairman of the Town of Brewster Conservation Commission, I encourage the Massachusetts Coastal Zone Management Department to fund the Town's proposal *Building Coastal Resilience in Brewster*.

Brewster proposes to develop a comprehensive sediment movement study to better understand the long term effects climate change and rising sea levels will have on the town's beaches and coastal ecosystem. The plan also includes specific engineering analysis of beach profiles, landforms, and possible effects of shoreline stabilization methods. Brewster's plan for coastal change will link ecosystem health with increased resiliency. The Conservation Commission strongly supports having a separate Order of Conditions for each town landing, including engineered plans, recommendations for ongoing maintenance, and monitoring of erosion after storm events.

In addition, the Town is proposing specific projects that involve coastal retreat, habitat restoration and the use of green infrastructure to treat and manage stormwater at three threatened coastal landings. We encourage the proposed public meeting process that will inform our citizens of the likely changes to come along our shoreline and allow them the opportunity to guide our planning process. Using natural systems to adapt to storm events and to provide habitat is part of the Conservation Commissions goals in administering the Wetlands Protection Act.

Among towns on Cape Cod, Brewster is a proven leader in protecting and restoring its natural coastal ecosystems. Over the last decade, the Town restored 11 acres of salt marsh at Quivett Creek on the west end of town, 10 acres of salt marsh at Namskaket Marsh at the east end, 21 acres of salt marsh surrounding Freemans Pond, the town's only salt pond, and a further 20 acres of salt marsh at Paines Creek in the Stony Brook valley. In addition, Brewster and its partners have preserved more than one-third of its land area as open space for conservation and water resource protection.

Brewster's project will provide significant ecological benefits; include restoration of beach and dune habitat for wildlife. Projects will also treat and in some cases eliminate direct discharges of stormwater into protected resource areas. Brewster has proven its ability to conduct innovative and progressive projects, such as the coastal retreat at Paines Creek Beach, which included removal of a paved parking lot from a dune with restoration to its original natural condition.

These planning efforts will allow for future retreat and migration of landforms and resources. I believe this project will provide transferrable results that can be used by other coastal communities, on and off Cape Cod. Brewster has demonstrated success in managed retreat and coastal restoration. I urge you to support this important proposal.

Sincerely,

A handwritten signature in blue ink, appearing to read "Paul C. Wightman", with a stylized, flowing script.

Paul C. Wightman, Chairman  
Brewster Conservation Commission



**Town Of Brewster**  
2198 Main Street  
Brewster, Massachusetts 02631-1898  
(508) 896-3701  
FAX (508) 896-8089

**Comprehensive Water  
Planning Committee**

February 25, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

The Town of Brewster Comprehensive Water Planning Committee is pleased to support Brewster's proposal - *Building Coastal Resilience in Brewster* - to the Massachusetts Coastal Zone Management Department to support the Town's efforts to understand and plan for ongoing and future coastal change and to increase the town's resiliency of our coastal infrastructure, beaches, dunes and marshes.

Brewster started its Integrated Water Planning efforts in 2008 with the hiring of our first Town Planner, whose responsibilities included overseeing the development of the Town's Integrated Water Resources Management Plan (IWRMP). A Comprehensive Water Planning Committee (CWPC) was formed in 2009. Over the last 5 years, the Town has produced an analysis of the existing information and materials available for the IWRMP; several projects to address areas where data was lacking, or where data sources could not be linked under present conditions; a needs analysis for drinking water, wastewater, surface water and stormwater; and a report analyzing possible alternatives to address both existing regulatory limits on nutrients and surface water pollution issues. To date, the Town has appropriated over \$700,000 for water planning efforts.

The planning portion of this proposal will provide critical data needed to complete Brewster's IWRMP, including changes to stormwater loading in coastal areas. It will also provide essential planning tools to manage the long term effects of an eroding and receding shoreline on Brewster's citizens and infrastructure. The engineering design portion of the grant application will address significant stormwater issues identified in the IWRMP by minimizing its generation, and by using natural systems to absorb and treat nutrients and pollutants. It will also improve the resilience of the Town's infrastructure in these vulnerable areas.

Julia Knisel  
February 25, 2014  
Page 2

As the Chair of the committee responsible for evaluating Brewster's water resources, I believe the work laid out in this proposal is critical to our future Town planning decisions. The CWPC has voted to support this grant application. I urge you to support this important proposal that links ecosystem health with increased resiliency.

Sincerely,

A handwritten signature in dark ink, appearing to read "Lemuel Skidmore". The signature is fluid and cursive, with a large initial "L" and a long, sweeping underline.

Lemuel Skidmore, MS, MPH, Chair  
Brewster Comprehensive Water Planning Committee



**Town Of Brewster**  
2198 Main Street  
Brewster, Massachusetts 02631-1898  
(508) 896-3701 ext. 133  
FAX (508) 896-8089

Planning Board  
William C. Hoag  
Chair

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

February 27, 2014

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

The Town of Brewster Planning Board is pleased to support Brewster's proposal - *Building Coastal Resilience in Brewster* - to the Massachusetts Coastal Zone Management Department to support the Town's efforts to understand and plan for ongoing and future coastal change and to increase the town's resiliency of our coastal infrastructure, beaches, dunes and marshes.

Brewster took a great step forward in planning in 2008 with the hiring of our first Town Planner, whose responsibilities included overseeing the development of the Town's Integrated Water Resources Management Plan (IWRMP). This connection to water planning has enabled the Planning Board to more effectively address water issues in Brewster. Actions taken by the Planning Board include the creation of an illicit discharges by-law for municipal storm drains; ongoing work on a zoning amendment to expand the Town's stormwater regulations, particularly as they apply to new development; and the creation of fertilizer regulations to reduce nutrient loads from these sources. The Board will also be working with Brewster's Comprehensive Water Planning Committee (CWPC) to create by-laws and regulations that will help to manage nutrient loading to our ponds, beaches and embayments.

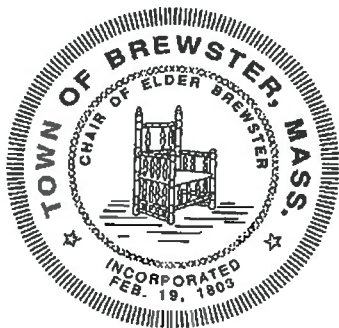
The planning portion of this proposal will provide critical data, including changes to stormwater loading in coastal areas. It will also provide essential planning tools to manage the long term effects of an eroding and receding shoreline on Brewster's citizens and infrastructure. This information can be used by the Planning Board to amend our zoning by-laws to more closely represent existing and future conditions, and make sure that future development is created with an eye towards resiliency.

As Chair of the Planning Board, I believe the work laid out in this proposal is critical to our future Town planning decisions. The Planning Board has voted unanimously to support this grant application. I urge you to support this important proposal that links ecosystem health with increased resiliency.

Sincerely,

*Richard Judd*, VICE-CHAIR FOR  
William C. Hoag, Planning Board Chair





**Town Of Brewster**  
2198 Main Street  
Brewster, Massachusetts 02631-1898  
(508) 896-3701 x1150  
FAX (508) 896-8089  
sleven@brewster-ma.gov

**Office of:**  
**Planning Department**  
**Susan M. Leven AICP**  
**Town Planner**

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

February 27, 2014

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

As the Planner for the Town of Brewster, I would like to add my support to Brewster's proposal - *Building Coastal Resilience in Brewster* - to the Massachusetts Coastal Zone Management Department to support the Town's efforts to understand and plan for ongoing and future coastal change and to increase the town's resiliency of our coastal infrastructure, beaches, dunes and marshes.

I was hired as Brewster's first Town Planner in its 205 year history in 2008. Along with the job of establishing a Planning Department, I was also tasked with organizing and managing the Town's water planning process and development of the Town's Integrated Water Resources Management Plan (IWRMP). This connection of land use planning and water planning has enabled us to more effectively address water issues in Brewster. In recent years, Brewster has adopted a number of by-laws and regulations aimed at protecting the Town's land and water resources including our Natural Resource Protection Design by-law – the first conservation subdivision by-law adopted on Cape Cod -- and an illicit discharges by-law for municipal storm drains. Work is continuing on a zoning amendment to expand the Town's stormwater regulations, particularly as they apply to new development; and the creation of fertilizer regulations to reduce nutrient loads from these sources.

The planning portion of this proposal will provide critical data, including changes to stormwater loading in coastal areas. It will also provide essential planning tools to manage the long term effects of an eroding and receding shoreline on Brewster's citizens and infrastructure. This information can be used to amend our zoning by-laws to more closely represent existing and future conditions, and make sure that future development is created with an eye towards resiliency.

I believe the work laid out in this proposal is critical to our future Town planning decisions. I urge you to support this important proposal that links ecosystem health with increased resiliency.

Sincerely,

  
Susan M. Leven AICP



# Brewster Fire Department

1657 Main Street  
Brewster, MA 02631  
Phone 508-896-7018 Fax 508-896-4245



February 24, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

The Town of Brewster Fire & Rescue Department is pleased to support Brewster's proposal- *Building Coastal Resilience in Brewster*- to the Massachusetts Coastal Zone Management Department as we look to solidify our community's efforts to understand and develop plans for ongoing and future coastal change and to increase the town's resiliency of our coastal infrastructure, beaches, dunes and marshes.

The Town is proposing specific projects that involve coastal retreat, habitat restoration and the use of green infrastructure to treat and manage storm water at some of its coastal landings and parking areas.

I have cooperatively worked with our town GIS staff to develop estimates of properties and infrastructure that will be affected by rising sea levels and potential future storm events and coastal flooding. Based on this work, we have found the need to develop and establish long term plans to replace vulnerable coastal infrastructure and to identify and provide access points to these areas for emergency vehicles and personnel as some of the most critical components of our community's Emergency Response Plan. The proposed development of a coastal resiliency strategy will be a key part of how Brewster adapts and keeps its citizens safe. These planning efforts will also be essential for our citizens to understand the risks inherent in living in a low lying coastal environment. Most importantly, the plan will ensure our community's first responders are provided an effective work environment that supports their personal safety and the safety of our residents.

I believe this project will also provide transferrable results that can be used by other coastal communities, on and off Cape Cod. The Town of Brewster has demonstrated experience in managed retreat and coastal restoration efforts. I urge you to support this important proposal.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robert Moran".

Robert Moran, Chief  
Brewster Fire & Rescue Department

# BREWSTER POLICE DEPARTMENT

Chief Richard J. Koch, Jr.

631 Harwich Road

Brewster, Massachusetts 02631

Phone 508-896-7011 [www.brewsterpolice.org](http://www.brewsterpolice.org) Fax 508-896-4513

February 26, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

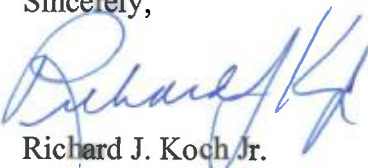
I am pleased to support Brewster's proposal- *Building Coastal Resilience in Brewster*- to the Massachusetts Coastal Zone Management Department in support of the Town's efforts to increase the resiliency of its coastal infrastructure, beaches, dunes and marshes.

My years of experience in Brewster responding to coastal storm events and the changes to our coast due to rising sea levels and significant coastal erosion raise increasing concerns with public safety based on these effects. In recent years we have had storm events undermine and damage homes, damage roads and parking areas at the beach, and flood typical evacuation routes.

Brewster needs to develop and establish long term plans to replace or change vulnerable coastal infrastructure and provide for access by emergency vehicles and personnel during and after these events. The proposed planning efforts will be a key part of how Brewster keeps its citizens and first responders safe. These planning efforts will also be essential for our citizens to understand and adapt to the risks inherent in living in a low lying coastal environment. This project will also provide transferrable results that can be used by other coastal communities.

Brewster has demonstrated experience and success in managed retreat and coastal restoration. I urge you to support this important proposal.

Sincerely,



Richard J. Koch Jr.  
Chief of Police

Town of Brewster Police Department



*Cape Cod's Ecotourism Destination*

February 20, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal Building Coastal Resilience in Brewster to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

The Brewster Chamber of Commerce' mission is to "strengthen, support and promote the economic feasibility, cultural richness, social needs and environmental sensitivity" of Brewster. To that end, we are pleased to support the Town of Brewster's proposal "Building Coastal Resilience in Brewster". Businesses on Cape Cod recognize that the environment is our economy and this project will lead to a better understanding of coastal change and how to plan for this to increase the resiliency of our coastal infrastructure including our beaches, dunes and marshes.

Brewster has 10 coastal access points, which are used by residents as well as the visitor population, estimated at 25,000 during the peak summer months. These points also provide access for emergency response, to shellfish grants, and for coastal nourishment projects. In recent years, storm damage and annual erosion rates of over 1 foot have significantly impacted town parking areas, beaches, roads and access points. The Town has invested significant amounts in recent years to repair these landings and the natural systems surrounding them, including over \$2,000,000 in salt marsh restoration and coastal retreat projects.

Among towns on Cape Cod, Brewster is a proven leader in protecting and restoring its natural coastal ecosystems. Over the last decade, the Town restored 11 acres of salt marsh at Quivett Creek; 10 acres of salt marsh at Namskaket Marsh; 21 acres of salt marsh surrounding Freemans Pond, the town's only salt pond; and a further 20 acres of salt marsh at Paines Creek in the Stony Brook valley. In addition, Brewster and its partners have preserved more than one-third of its land area as open space for conservation and water resource protection.

**Brewster Chamber of Commerce**

PO Box 1241, Brewster MA 02631

T: 508-896-3500 E: [info@Brewster-CapeCod.com](mailto:info@Brewster-CapeCod.com)

[www.Brewster-CapeCod.com](http://www.Brewster-CapeCod.com)

Brewster's project will provide significant ecological benefits, including restoration of beach and dune habitat for wildlife. The proposal will identify the natural systems at risk, the forces shaping coastal change, including sediment fate and transport, and allow the town to conduct long term planning to relocate or adapt our most at-risk infrastructure. The plan will also treat and in some cases eliminate direct discharges of stormwater into protected resource areas.

The proposal includes a significant coastal retreat design for Breakwater Beach, which has one of the largest beach parking lots, including restoring former parking areas to coastal dune and green stormwater control; a measured retreat at two landings (Mants and Ellis) that have suffered significant repetitive losses; a sediment study including Brewster's entire coastline (and extending partially into each neighboring town); engineering evaluation of each access point and beach with short and longer term recommendations for nourishment or alterations and the effect on the natural systems surround each location.

Sincerely,

A handwritten signature in black ink, reading "S. Kyle Hinkle". The signature is fluid and cursive, with the first name "S." and last name "Hinkle" clearly legible.

Ms. S. Kyle Hinkle  
Executive Director

**Brewster Chamber of Commerce**

PO Box 1241, Brewster MA 02631

T: 508-896-3500 E: [info@Brewster-CapeCod.com](mailto:info@Brewster-CapeCod.com)

[www.Brewster-CapeCod.com](http://www.Brewster-CapeCod.com)





February 25, 2014

Ms. Julia Knisel  
Coastal Shoreline & Floodplain Manager  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for Town of Brewster, Massachusetts proposal  
"Building Coastal Resilience in Brewster"

Dear Ms. Knisel,

On behalf of the Association to Preserve Cape Cod (APCC), I am pleased to provide this letter expressing our strong support for the proposal by the Town of Brewster entitled "Building Coastal Resilience in Brewster". This letter also describes our commitment to providing match for the proposed project.

APCC was founded in 1968 to promote policies and programs that enhance the protection of the natural resources of Cape Cod. APCC is the Cape's largest environmental organization and has 5,000 members from all 15 towns on Cape Cod. In our 46 years, we have successfully advocated for protection of the Cape's water resources, open space, and natural resources, and the adoption of regional growth management policies (see [www.apcc.org](http://www.apcc.org) ).

Since 2006 APCC has served as the Regional Service Provider of the Cape Cod region of the Massachusetts Bays Program, whose mission is to protect and restore the coastal ecosystems of Cape Cod Bay and Massachusetts Bay (<http://www.mass.gov/eea/agencies/mass-bays-program/> ). APCC's Senior Scientist, Dr. Jo Ann Muramoto, is the Mass Bays Program's Regional Coordinator for Cape Cod and provides technical assistance, outreach and facilitation to help communities restore and protect coastal ecosystems of Cape Cod Bay. This letter also describes the Mass Bays Program's commitment to providing match for the proposed project.

The Town of Brewster proposes to evaluate the resiliency of their coastal systems using an innovative tool; namely, assessment of the sediment budget to identify areas that will be resilient and vulnerable to coastal erosion and sea level rise. This assessment will be utilized in the development of a coastal resiliency plan that will guide future decisions regarding management of the coastal zone and its resources. The Town will also conduct an implementation project to relocate vulnerable public infrastructure located on a public beach. Finally, they will provide public outreach to increase awareness of climate impacts and build support for climate adaptation measures.



Brewster has long been a leader in environmental protection and restoration on Cape Cod, and was recognized by APCC in 2012 for environmental excellence. Their achievements include using a comprehensive watershed approach to restoring the Stony Brook watershed, which included restoration of 41 acres of salt marsh, restoration of fish passage to 386 acres of herring spawning habitat, stormwater treatment, and preservation of hundreds of acres of open space in the Stony Brook watershed. The Town also restored two other tidally-restricted salt marshes at Quivett Creek and Namskaket Marsh, preserved one-third of the town's area as open space for conservation and habitat, enacted the first Natural Resource Protection District zoning bylaw on Cape Cod to protect water resources, and nominated the Inner Cape Cod Bay Area of Critical Environmental Concern.

Finally, Brewster is a leader in coastal adaptation. In 2012, it became one of the first towns on Cape Cod to conduct managed retreat from the coast by removing the Paines Creek Beach parking area that suffered from repetitive storm damage and relocating it to an inland location. This undevelopment project was followed by restoration of beach and dune habitat. This project was successfully completed and now serves as the model for the Town's proposed tasks for managed retreat at other town beaches.

APCC and the Mass Bays Program Cape Cod region are proud to partner with the Town of Brewster on this important proposal. APCC will provide match for the Town's proposal as described below:

- \$10,925 of in-kind assistance with project management, outreach and coordination: APCC and the Mass Bays Program Regional Coordinator for Cape Cod will provide in-kind match of 115 hours for one year, or \$10,925;
- \$5,000 of match to conduct photographic monitoring of coastal erosion and the restoration of beaches and dunes and to cover direct costs, to be provided by APCC through a grant from the Eddy Foundation of Brewster;
- \$5,000 of match to monitor the Freeman's Pond salt marsh that was restored in 2013 and to cover direct costs. This marsh is immediately inland of the barrier beach at Paines Creek Beach and the salt marsh where the oyster reef is proposed. This match will be provided by APCC through a grant from the Eddy Foundation of Brewster.
- **Total match to be provided: \$20,925.**

In addition, we will coordinate with the Town to provide the results of our ongoing project evaluating the effects of sea level rise on the mid-Cape's groundwater system as soon as feasible. APCC has been working with the U.S. Geological Survey which is modeling the effects of sea level rise on groundwater, and with the Cape Cod Commission (see <http://www.apcc.org/sealevelrise/index.html> ). We anticipate that preliminary results will be available in Summer 2015 and final results in Summer 2016. These results will be useful for the Town's efforts to evaluate the effects of sea level rise on Brewster's water and wetlands.

The Town of Brewster has a proven record in achieving on-the-ground restoration of coastal habitat and implementing coastal adaptation projects. We strongly urge you to support this important proposal.

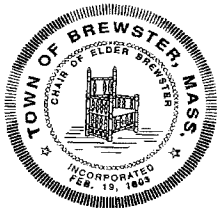
Sincerely,



Ed DeWitt  
Executive Director

cc: Charles Sumner, Town Manager, Town of Brewster  
Chris Miller, Director, Department of Natural Resources, Town of Brewster  
Pamela DiBona, Executive Director, Massachusetts Bays Program

ED/jm



# Town of Brewster

2198 MAIN STREET  
BREWSTER, MASSACHUSETTS 02631-1898

February 20, 2014

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the CZM FY14 Coastal Community Resilience Grant Program

Dear Ms. Knisel,

The Town of Brewster Brewster All Citizen Access Committee is pleased to support Brewster's proposal- *Building Coastal Resilience in Brewster* – to the Massachusetts Coastal Zone Management Department to fund Town efforts to understand and plan for coastal change and to increase the resiliency of Brewster's coastal infrastructure, beaches, dunes and marshes.

Brewster has 10 coastal access points, which are used by residents and the substantial tourist population. These points are also key access points for emergency response, access to shellfish grants, and access for coastal nourishment projects. In recent years, storm damage and annual erosion rates of over 1 foot have significantly impacted town parking areas, beaches, roads and access points. The Town has invested significant amounts in recent years to repair these landings and the natural systems surrounding them, including over \$2,000,000 in salt marsh restoration and coastal retreat projects.

Among towns on Cape Cod, Brewster is a proven leader in protecting and restoring its natural coastal ecosystems. Over the last decade, the Town restored 11 acres of salt marsh at Quivett Creek on the west end of town, 10 acres of salt marsh at Namskaket Marsh at the east end, 21 acres of salt marsh surrounding Freemans Pond, the town's only salt pond, and a further 20 acres of salt marsh at Paines Creek in the Stony Brook valley. In addition, Brewster and its partners have preserved more than one-third of its land area as open space for conservation and water resource protection.

Brewster's project will provide significant ecological benefits, including restoration of beach and dune habitat for wildlife. The proposal will identify the natural systems at risk, the forces shaping coastal change, including sediment fate and transport, and allow the town to conduct long term planning to relocate or adapt our most at-risk infrastructure. The plan will also treat and in some cases eliminate direct discharges of stormwater into protected resource areas.

The proposal includes a significant coastal retreat design for Breakwater, one of the largest beach parking lots, including restoring former parking areas to coastal dune and green stormwater control; a measured retreat at two landings (Mants and Ellis) that have suffered significant repetitive losses; a sediment study including Brewster's entire coastline (and extending partially into each neighboring town), engineering evaluation of each access point and beach with short and longer term recommendations for nourishment or alterations and the effect on the natural systems surround each location. In addition, the proposal includes a handicap accessible walkway to the beach through the restored dunes.

Sincerely,

  
Claire Gradone

Brewster All Citizens Access Committee Chair



## BREWSTER CONSERVATION TRUST

Box 268 Brewster, Massachusetts 02631  
[www.brewsterconservationtrust.org](http://www.brewsterconservationtrust.org)

Julia Knisel, Coastal Shoreline & Floodplain Manager  
Executive Office of Energy & Environmental Affairs  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114

February 28, 2014

Re: Letter of support for the Town of Brewster's proposal *Building Coastal Resilience in Brewster* to the Coastal Community Resilience Grant Program: RFR ENV 14 CZM 06

Dear Ms. Knisel,

It is a pleasure to write a letter of support for Brewster's proposal to the Coastal Community Resilience Grant Program. The proposal addresses critical needs along our coastline and proposes innovative and effective measures to enhance the resiliency of Brewster's town landings by working in a partnership with many local organizations, an approach which the Town has used very effectively on numerous other projects.

The Brewster Conservation Trust looks forward to serving as one of the partner organizations for this project. In particular we will assist in public outreach activities using the various tools that are at our disposal including our newsletter, e-news, Brewster Conservation Day, the portion of our annual meetings devoted to discussion of key issues in Town, and other products which we might develop specifically for this project. Our volunteer labor and material contributions should be considered part of the match to the State funding for the project.

We are pleased to continue the productive partnership with the Town which has included the protection of sensitive lands for conservation, producing a guide to Brewster walking trails, the annual organization of Brewster Conservation Day, and joint land management activities. We are particularly proud of the collaboration in securing vulnerable marsh front properties such as Quivett Marsh Vista and in ensuring that marshes, wetlands, and other sensitive town lands are under the control of the Conservation Commission.

Sincerely,

Henry P. Minis  
President

